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MAY, 1955

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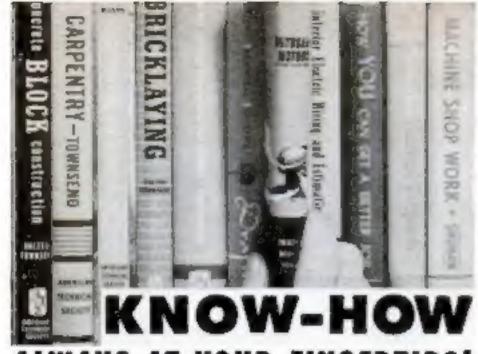


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It diests t make much difference how good the bat, is you use not he whanger a fish may be it he doesn't SFE it if he in t DitAWN to it you won't get a clobie? And test after test proved that unless you got the lure right under the fish's nose, you hampey cannot attract him to your Specific

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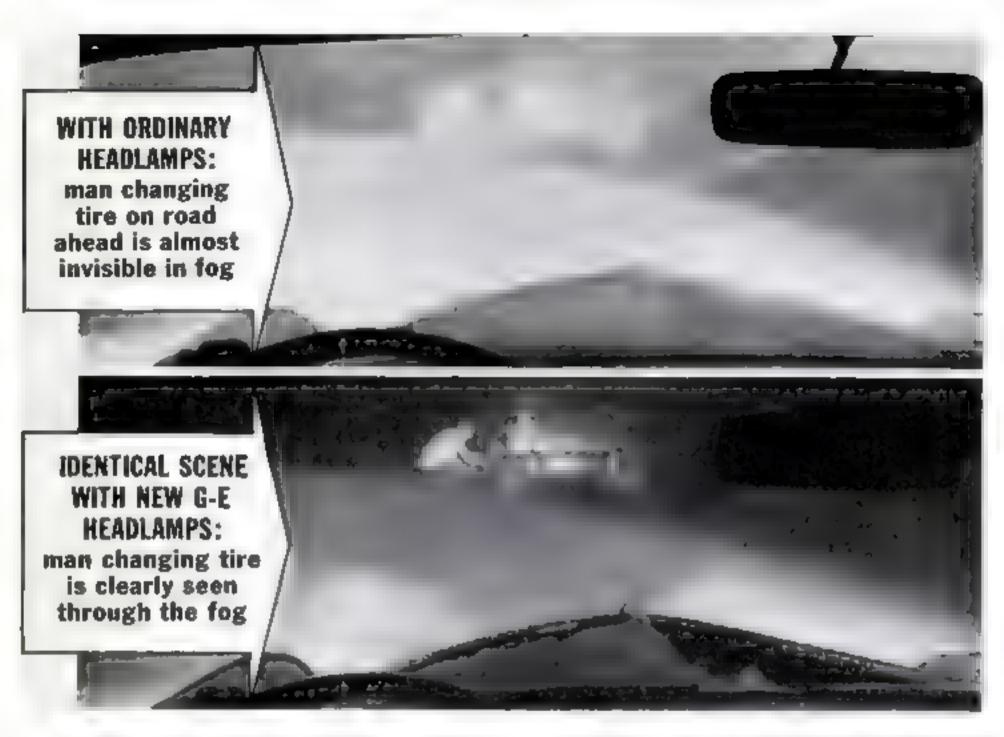
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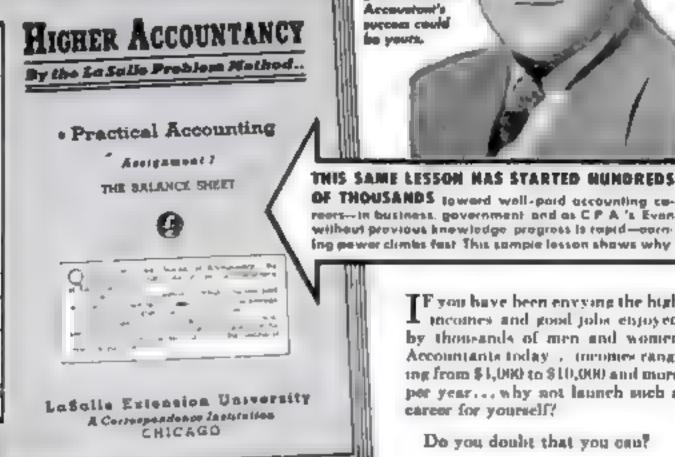


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Letters_

Hot Plugs Can't Scare Gus

In the February "Letters" column [p. 18] Mr. Dodakian seems to doubt that Gus could switch wires on the spark plugs while the engine is running—he'd get a shock. What would Mr. Dodakian think of changing plugs while in flight on a high-compression airplane engine with a scintilla magnet furnishing the shocking current? Lots of mechanics can ground out all four plugs on a four-cylinder engine with their fingers and stop the engine that way. The expression on



the person's face undergoes a slight change during the process, however.

WM. MORROW, Antioch, Tenn.

Three Honks for Careless Drivers

The Careful Drivers Club of Denver is sponsoring a campaign to shame traffic violators into safer driving. When a citizen sees a violation, he signals the violator by blowing his horn three times, making the blasts short to keep noise down.

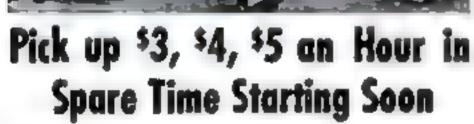
J. M. Phelps, President, Careful Drivers Club, Denver

Work on Choke Pays Off

I was only getting 12 miles to the gallon with my car. Then I read your article, "How to Keep an Automatic Choke Automatic" [Jan., p. 193]. Being too lazy to clean all the parts, I just set the choke a few notches leaner and cleaned the air cleaner

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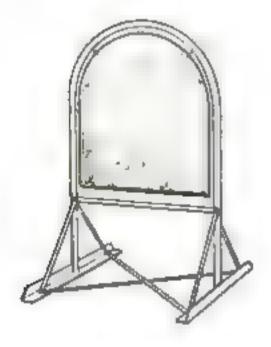
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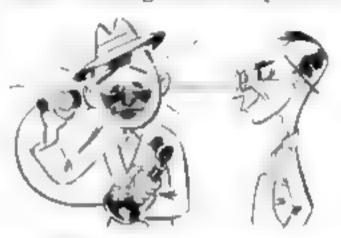
and now I get about 27 miles. I can hardly believe it. Let's have more useful information like this.

WILLIAM A. GREINER, Condon, Ore.

Tricking the Tricksters

In many stores in small towns like ours, the owners permit customers to use their telephones for free local calls. But some larcenous people sneak in expensive longdistance calls, then depart without paying the toll

So a friend of mine simply removed the little tab that holds the phone's number. Now when the long-distance operator asks



her usual "What is your number, please?" the call-maker is stymied, Mrs. STANLEY CLARK, East Bradenton, Fla.

Parts Cleaner Was Patented

Your February issue has a description of a parts cleaner in the department, "Hints from the Model Garage," This piece of equipment is a patented article manufactured by the Gale-Martin Corp., 540 W. 24th St., New York City.

CHARLES WULSTEIN, New York

A Vote for Controversy

I get a bigger kick out of many controversies in your Letters column than I do out of the Sunday funnies. I particularly like to read the heated exchanges on the subject of automobiles.

I see these people every day—the guy with the two tons of horsepower, gadgets and chrome; the guy with the sports car which cost him four thousand skins and which he claims saves him dough on gas, the guy with the motorcycle who maintains that there is no other way to travel, and who rides with me in our car when it rains; and particularly the guy who claims that the way to save dough is to buy a car and keep it eight years, and is always the first in town to be driving the new model each year.

But I particularly admire the guy who

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

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never enters the arguments, who doesn't do his darnedest to show his tail lights to every other driver in town, and is kind to his family and his dog.

But don't list me as antiprogressive, please. I have automatic drive, turn signals and a radio in my car, and I like them. Who knows, some day I may develop a taste for air conditioning, windshield washers and even a hydraulic seat which will shuffle me all over the car at the touch of a button

C. A. RAMBOW, c/o FPO, San Francisco

Mercury Mining Was Different Then

I read with interest the January article [p. 139] on the "Mysterious Boom in Mercury Mining." In 1918-19 it was far different. I saw flasks of mercury, worth \$75 each, stacked like cordwood on a Pennsylvania billside, for fulminate of mercury. This was used in caps and detonators.

Those stacks were fairly safe. It would have been hard for anyone to get away with a flask under each arm. Loval countrymen would have spotted a thief or a stranger way quickly

very quickly

R. E. BOWMAN, Blacksburg, Va.

By Any Other Name, It Still Sticks

Having just read your excellent article on installing plastic counter tops [Feb., p. 110], I am writing to compliment you There is one point, however, that I would like to draw to your attention. You say, "Spread gunk on the panel back and plywood subsurface."

"Gunk" is the trademark for a degreaser



compound. I know that this was not intentional, but it struck me as funny.

JACK S. SOUTHCATT, London, Ont.

Hereafter we'll stick with stickum, goo, glop or goop.

Lighted Level Easy to Make-or Buy

Like the gentleman from Minnesota, I too wanted an illuminated level for working in

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are your laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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dark corners ["I'd Like to See Them Make," Feb., p. 153]. So I bored a %" hole in my wood level and slipped in a dimestore "pen" flashlight, Cotton wadding wedges it tight.

A. J. WAIGHT, Hornell, N Y.

We are distributors for just such an item.
. . . Our Luma-Level comes complete with light and hatteries.

C. E. WOODEND, Arn-Wood Co., Denver

Good Question

Re: "How I Fly the Pogo Plane" [Feb. PSM, p. 122].

I would like to ask one question. How would you make a crash landing? It would be pretty hard to pancake, wouldn't it?

CHARLES N. REINSEL, Clarion, Pa.

If the engine failed, the Pogo pilot would have to bail out rather than try to crash-land

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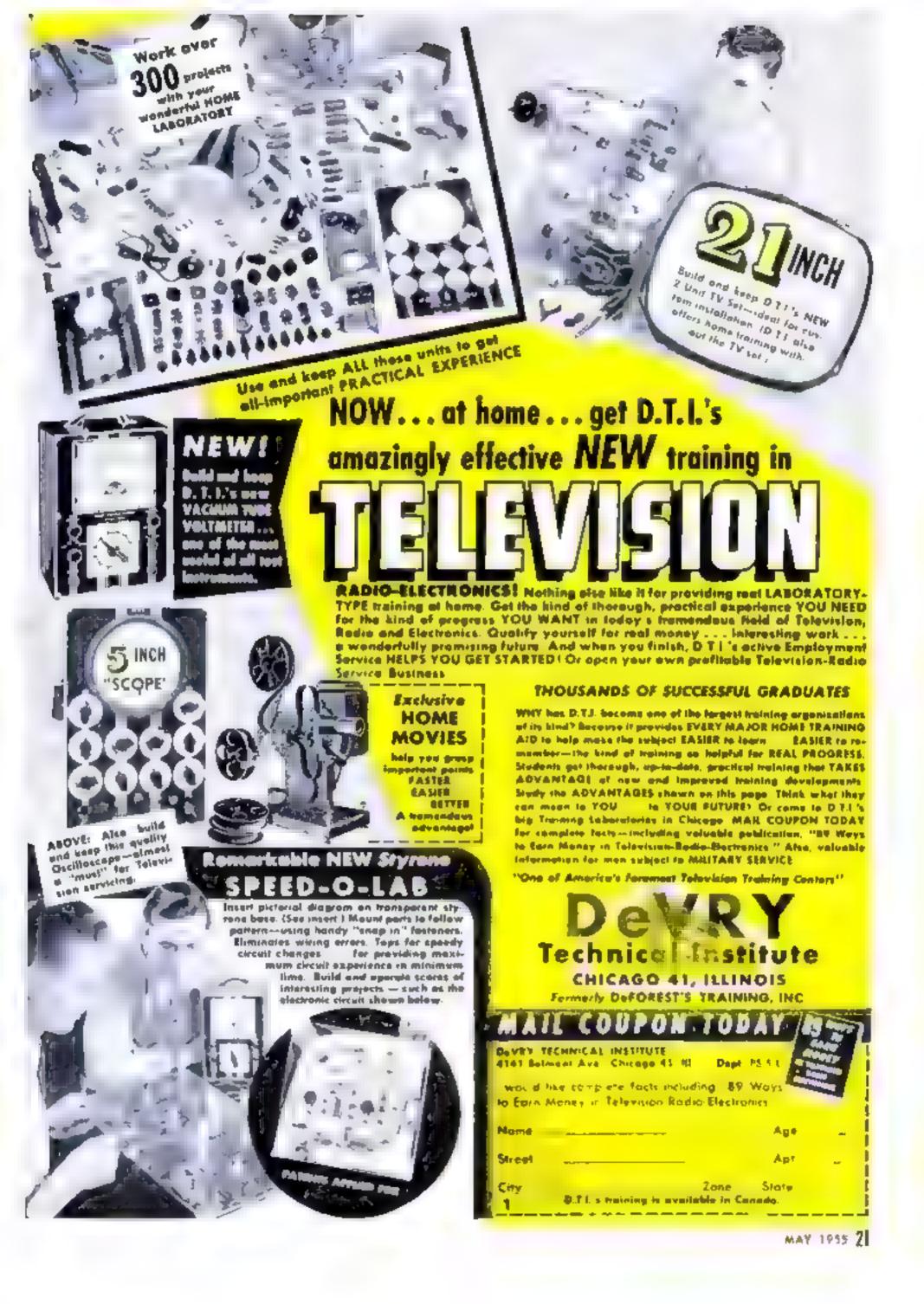


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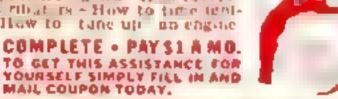
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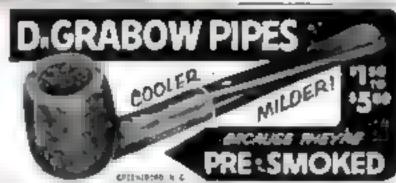
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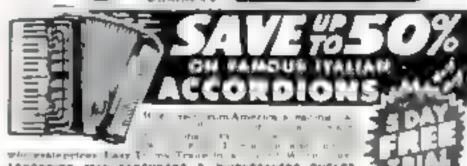
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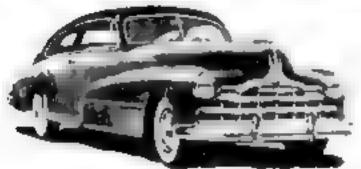
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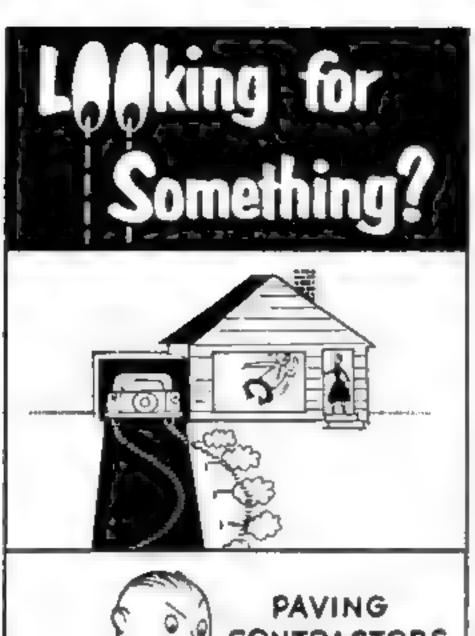
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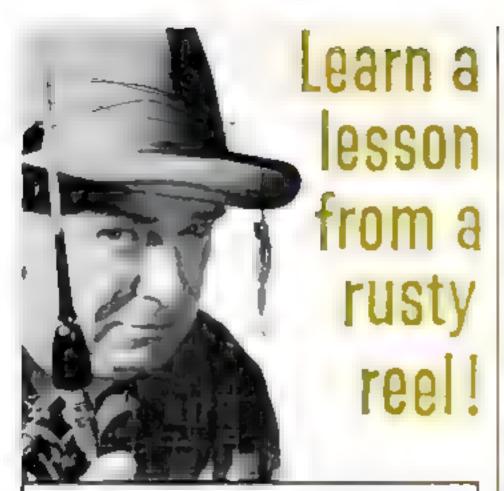
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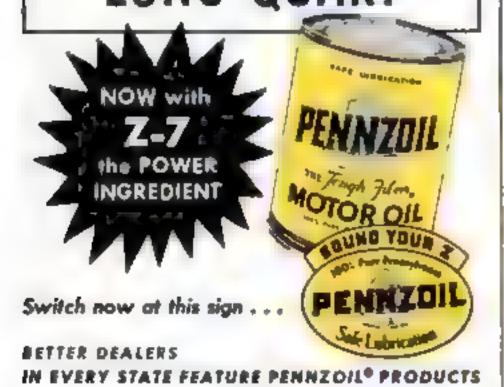
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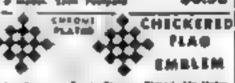
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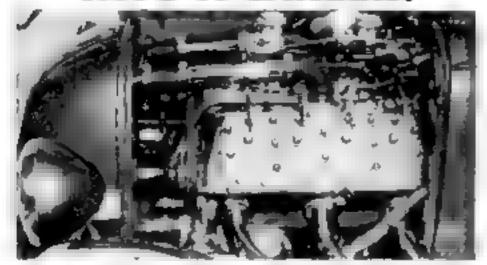


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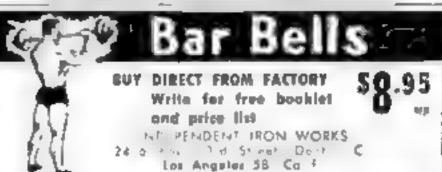
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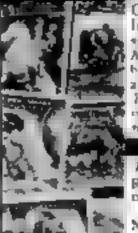
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Is your radiator ready for Summer driving?

SUMMER — with hot weather, more driving, heavier traffic—puts a two-way strain on your car's cooling system. The cooling load is much heavier and heat multiplies the speed of rust and corrosion.

A clean system. To get good heat transfer the cooling system must be clean. Often the inside surfaces are coated with dirt, grease, rust or mineral scale. Sometimes there's enough sediment and rust to clog up some passages and part of the reductor section. If fan and pump are working right, a dirty system is the most likely cause of engine overheating.

Take out anti-freeze. Anti-freeze, too, increases overheating. In hot weather, it is important to remember that water can transfer more heat than anti-freeze solution does. Result? A combination of anti-freeze and a dirty system will cause enough overheating to cost you as much as 6 points in gasoline octane rating. Put another way, that means the equivalent loss of 1½ gallons of premium gasoline in every tankful.

Stop corrosion domage . Water alone will cause rust and corrosion. In Summer heat, water plus carbon dioxide, exhaust gases and other likely impurities can cause serious corrosion damage. The inhibitors in anti-freeze will protect you for the winter, but they may become exhausted and you can't depend upon them for Summer driving.

Expert advice • The Society of Automotive Engineers recommends, "Where anti-freeze has been used, drain the solution in the Spring; flush the system thoroughly and clean if necessary; then install a fresh filling of Summer rust inhibitor and water."

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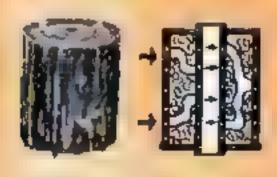
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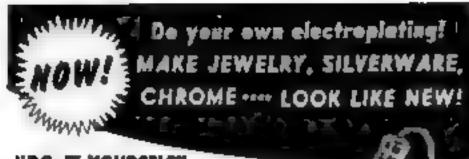
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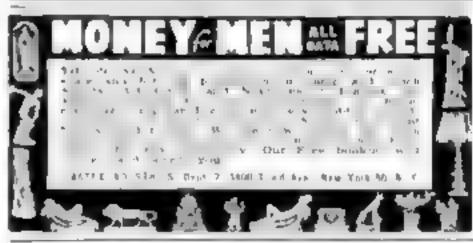
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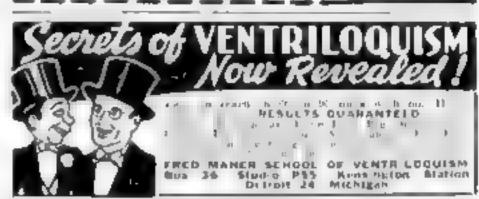
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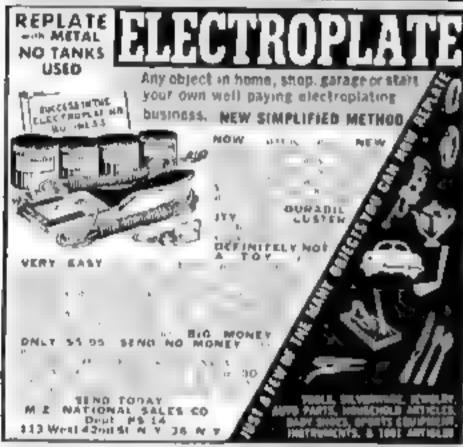


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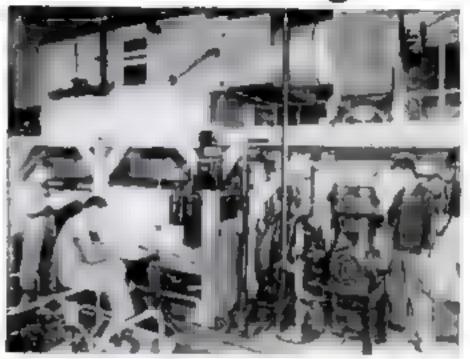
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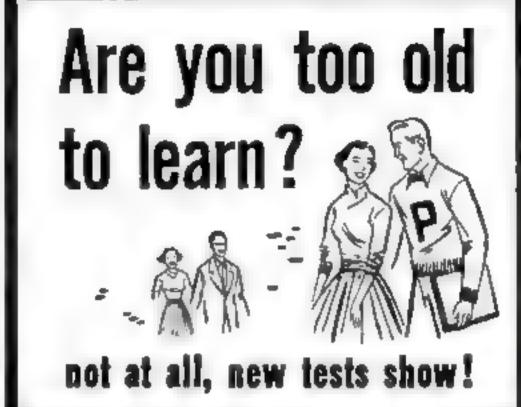
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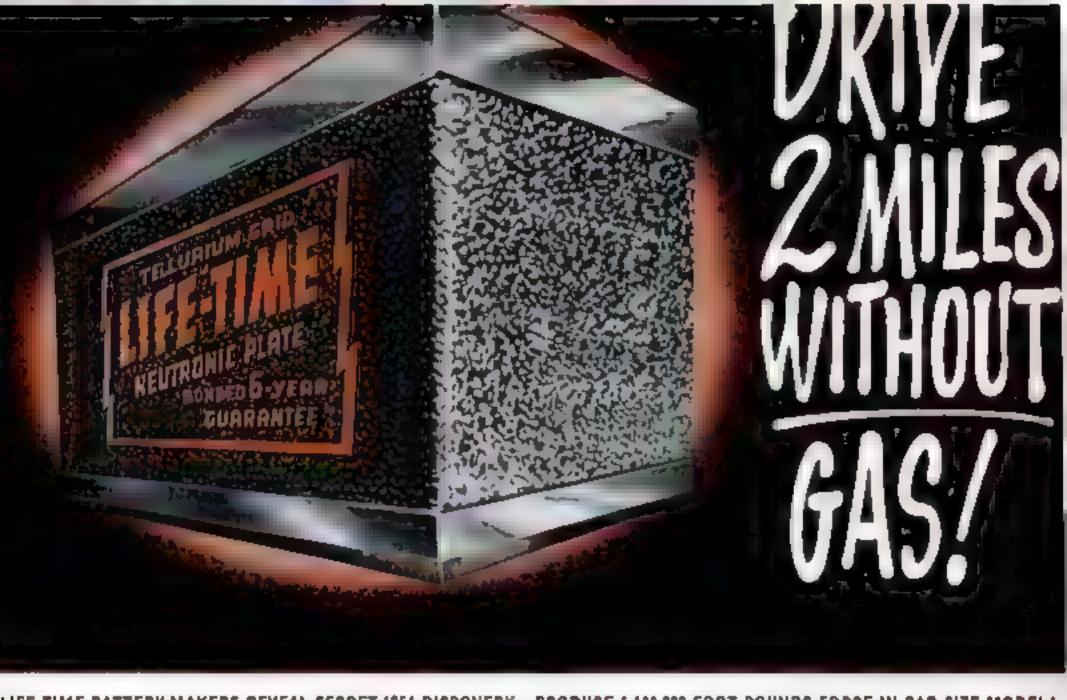
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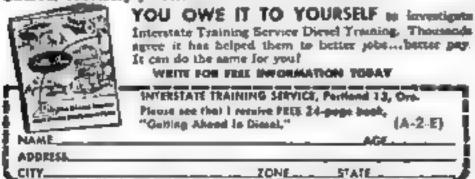
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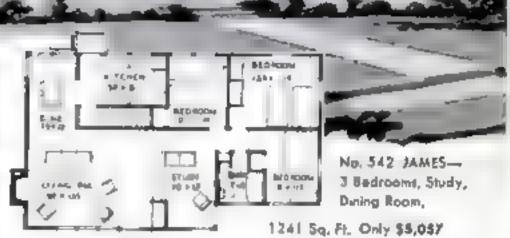
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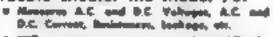
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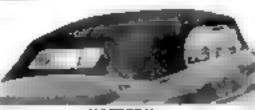


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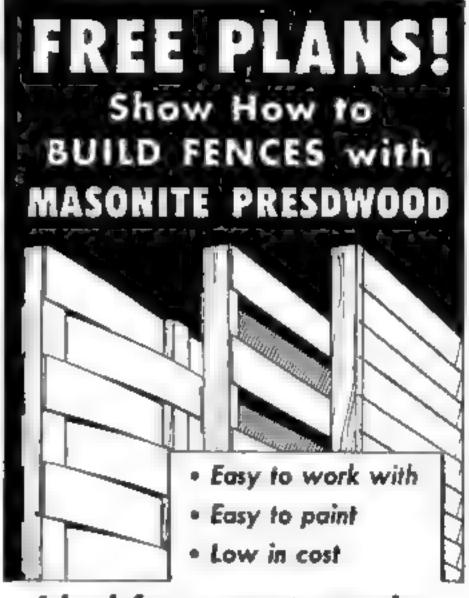
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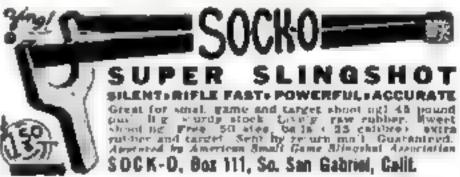




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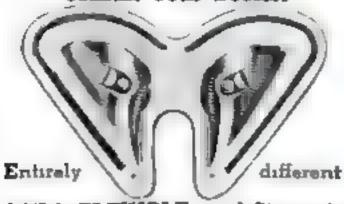


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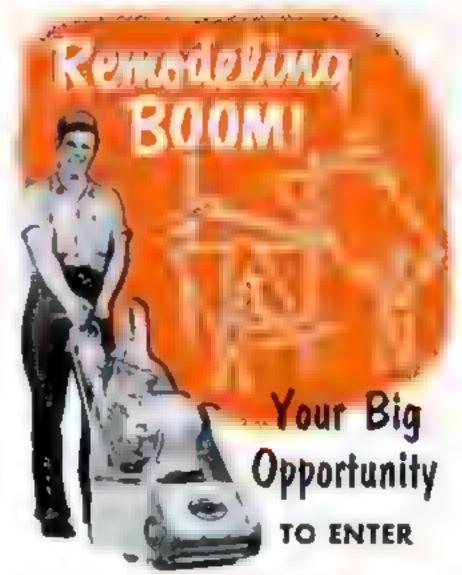
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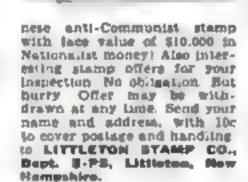
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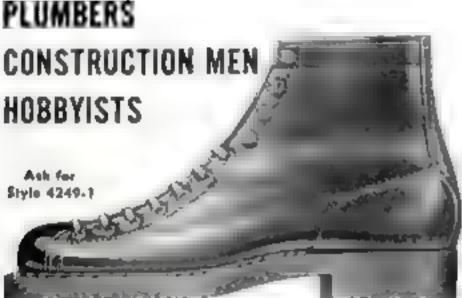


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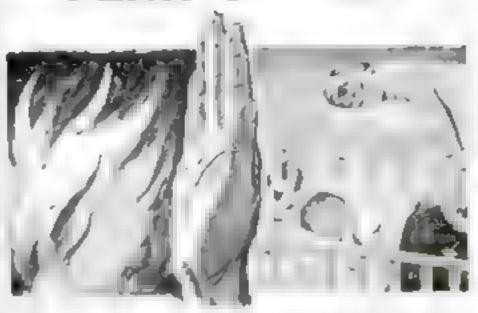
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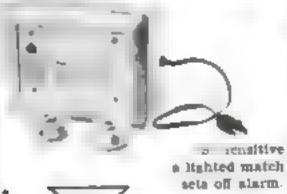
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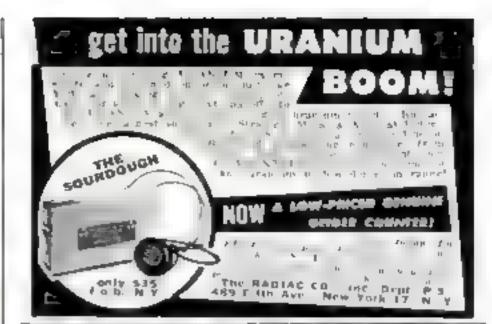
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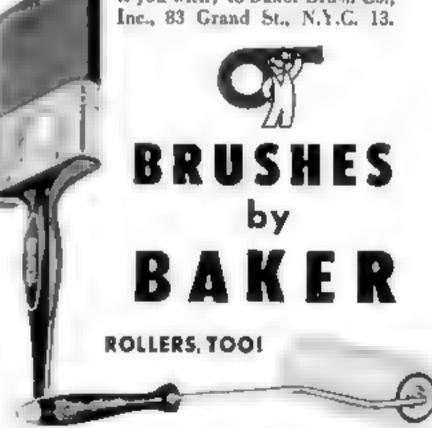
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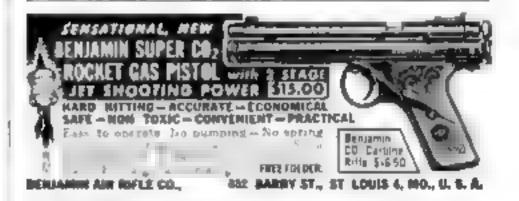
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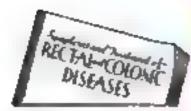


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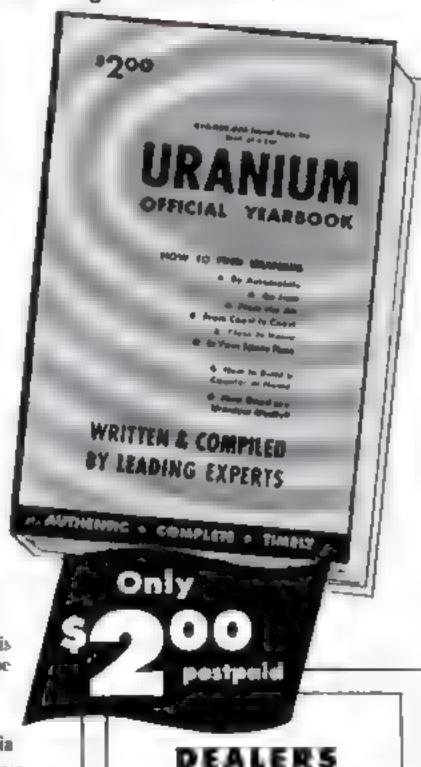
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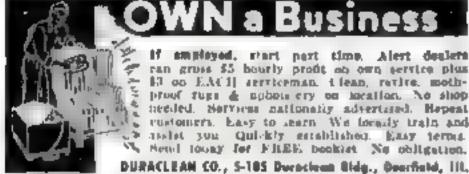
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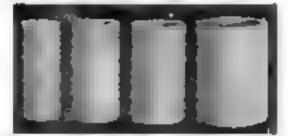
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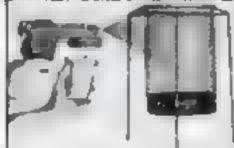
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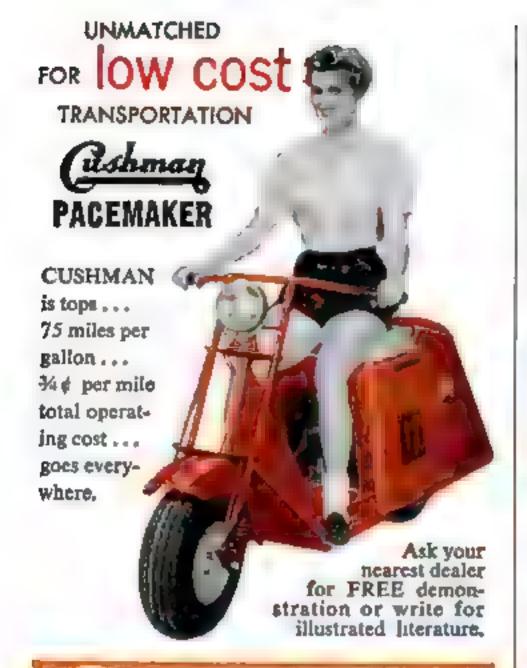
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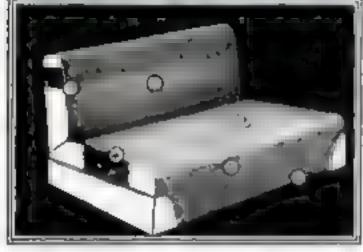
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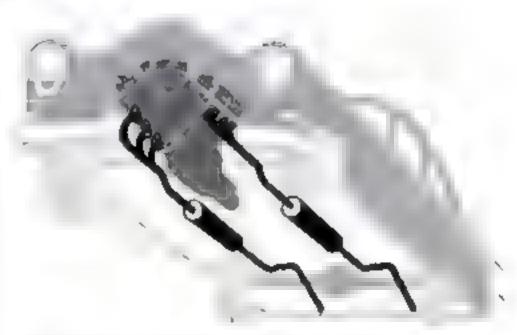


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Car factories such as Ford, Cadillac and Mercury find that duals are necessary to get the utmost in power, speed and gas economy from today's high-compression engines. Duals eliminate the excessive back-pressure built up by conventional exhaust systems. Now you can get the same results on your car with a Dynatone dual or header system. Your V8 will have improved carburetion, faster pick-up, greater performance. Dynamometer tests show that Dynatone duals deliver 11.7% more hp at 60 mph headers 16.4% more at 70 mph.

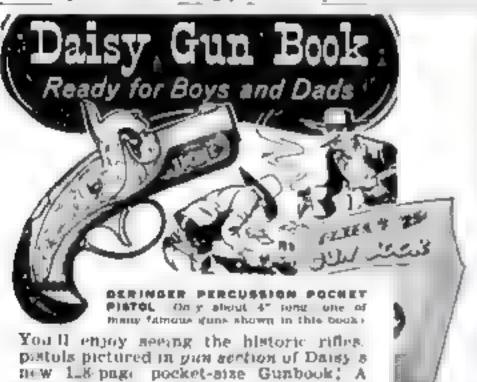
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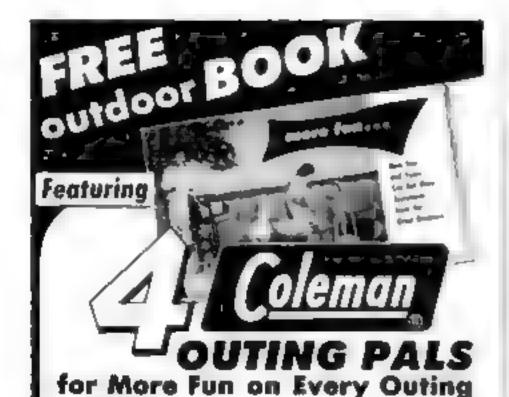
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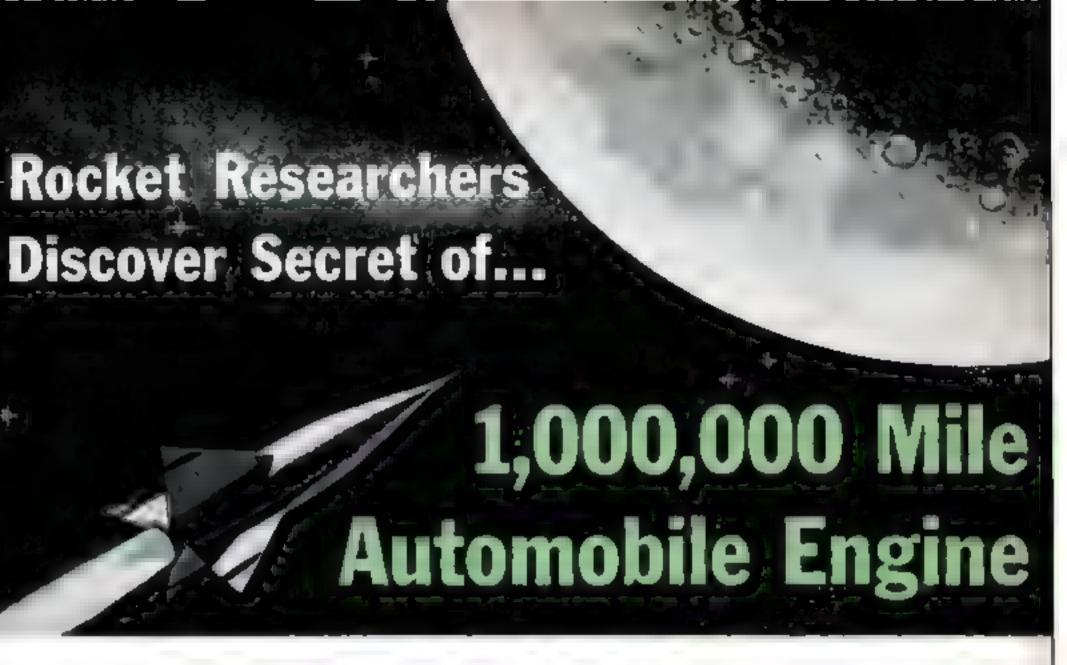
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DELLO FLASHING POWERL



Your Present Engine Can Last Years Longer ... Thanks to New Sintered Metal Filter Method!

THIS IS THE SECRET that wouldn't keep—the invention that may put men on the moon years before experts believed it could be done. This is the discovery that can make present-day automobile engines last hundreds of thousands of miles—and save millions of dollars for average car owners by reducing operating expenses. Yet, like many great discoveries, it is based on simple principles.

Friction, as every schoolboy knows, is what makes engines wear out. In early steam engines, this was such a minor problem that tailow was good enough for lubrication. Even in the first gasoline engines, almost any kind of oil could do the job.

But as engine heat increased and piston speeds approached 3000 feet per minute, lubrication engineers had to develop new oils containing "additives" you hear so much about.

Oil companies claim these additives are worth the extra 15c to 25c a quart you're paying for oil—and they're right. Purpose of these additives is to keep carbon and gum in harmless suspension in your oil—prevent deposits from forming in your engine. That's why your

oil should look dark after a few miles of driving.

But here's the catch: ordinary filter packs made of absorbent material take out these valuable additives. The more often you change filter packs, the more additives you take out. Your oil looks "cleaner"—but you have more carbon, gum and additives forming in your engine.

Shocking? Yes, but that's only part of the story. Oil companies have developed still other additives—such as barium and molybdenum—which may make an engine overhaul something you don't even start thinking about

a four page report on the most important lubrication discovery in a lifetime!

How to Get a Life-Time Filter for 2 Weeks Trial in Your Car or Truck

You can try a Life-Time filter in your car for two weeks to see if it's really all we say it is (it is, and more). If, however, you decide you don't want to keep it because you miss the fun of buying filter packs, or for any reason, all you do is send it back for a refund, with no questions asked. Ordering is simple:

1. If your car already has an oil filter, you can convert it to a Life-Time filter with a kit which replaces your throwaway pack with permanent metal. Just send us the make and number of your present filter pack (if you know it); otherwise, send us the make, model and year of your car or truck. Enclose \$6.95 (we pay shipping) or send \$2.00 deposit (you pay balance and C. O. D. charges on arrival).

2. If your car has no filter now, or you want to replace the one you have, send us the make and model of your car and \$12.95 (we pay shipping) or \$5 deposit, balance C.O.D.

3. Specially-designed conversion kits for cars with full flow systems and for Buicks with hydraulic valve lifters: \$13.95 (we pay shipping). Or enclose \$2 and pay balance and C.O.D. charges on arrival.

EASY TO INSTALL

If your car already has an oil filter, you can install a Life-Time permanent metal alloy element as easily as changing throwaway filter packs. If your car has no filter now, you can install a complete Life-Time unit fairly easily; no special tools are needed.

See your authorized Life-Time dealer or order direct from the manufacturer. Do it today—before you waste another cent on filter pack replacements.

Permanent Filte Continental Ma Washington Bly Culver City, Ca	nufacturing	Corp.
Rush Life-Time	filter for:	
Make, model, ye	ear of car	
Present filter	make and n	nodel (if known)
I enclose		
56.95 for confactory pays		full flow, \$13.95);
\$2.00 de C.O.D.	posit for cor	oversion kit; send
	complete u	nit (\$18.95 for hipping.
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Name		
Address		
City	Zone	State

1. Conversion Kit

replaces present filter element with Life-Time metal alloy.



2. Complete Unit

... which replaces entire old filter, is easily installed,



WHY NOT MAKE JUST ONE SIZE?

Actually, it is fairly easy to make a metal oil filter that can be installed on any make or model of car. Trouble is, different cars have different oil capacities, oil pressures, etc. A "universal" model oil filter that did a halfway job in all cars and a good job in none would be a waste of money, no matter how cheap it was.

That's why special models of the Life-Time filter were designed for every ear, truck, agricultural vehicle, etc. It cost a great deal of money and took many years to engineer and test these special porous metal filters. Only the original, genuine Life-Time oil filter has a model engineered especially for your car

This saves the car owner the expense and nuisance of returning "universal" filters that don't do the job. It builds good will for dealers who handle the original, genuine Life-Time filter.

See your authorized Life-Time dealer or order direct from the manufacturer. Do it today-before you waste another cent on filter pack replacements!

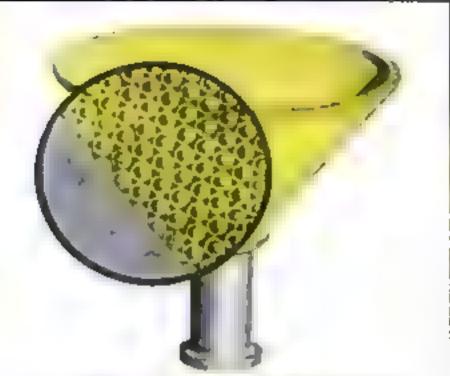


Opportunities Now for Life-Time Filter Dealers and Distributors

A dealer and distributor network is now being formed to handle demand generated by 4-page reports like this published in leading national magazines, plus sponsorship of radio and television broadcasts of the Indianapolis 500 and the Panamerican Road Race.

For complete information on how you can be first with the most exciting automotive product of this decade, write or wire:

Continental Manufacturing Corporation Dept. CPS-5, Washington Blvd. & Motor Ave. Culver City, California © 1954



have already formed in your engine. Laboratory tests prove it does this.

Road tests (see graph) prove that engine life is greatly increased by the Life-Time filter because it removes all dangerous abrasives, removes acid-producing water and makes acid-already in your oil harmless.

Only the original, genuine Life-Time metalalloy filter proves its claims of increased engine life by both laboratory and road tests.

How The LIFE-TIME Filter Works

As dirty oil is forced through element, all harmful particles drop to bottom of filter case. Only pure, filtered oil can get back into circulation.

MAT WATER OIL



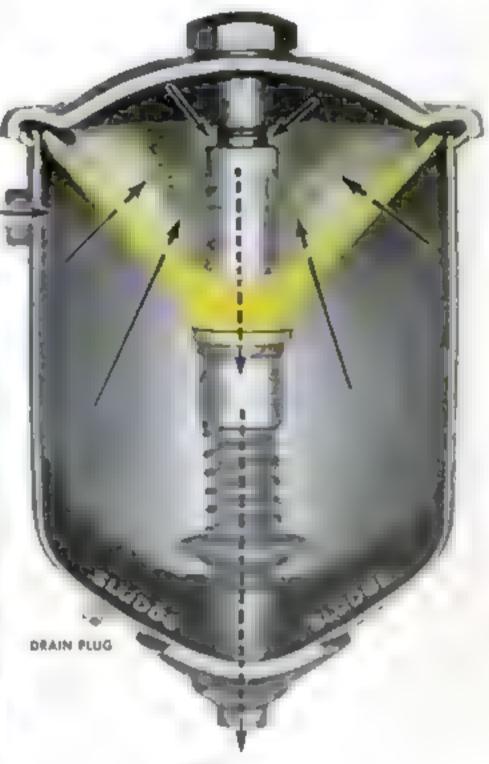
"SMOKE TEST" proves superiority of Life-Time porous metal filter. Ordinary filters cause oil pressure to drop when fibers soak up oil, expand and prevent free circulation.

Life-time Oil Filter Never Wears Out—eliminates filter pack replacement forever!

You never change the Life-time filter—just rinse it occasionally in gasoline and it's good as new. In addition, you save the quart of oil soaked up and thrown away regularly with ordinary replacement filter packs, which can add up to a lot of oil during the life of this filter. How long is that? Well, the Life-time filter is guaranteed for 10 years,

But since the metal alloy never wears out, the money you save on the filter packs you don't have to buy, plus what you save in engine overhauls, is something for your life insurance man to figure out for you.

To find out how you can have a permanent metal Life-Time filter on your car, see next page.



QUILET (CLEAN QIL)

until 250,00 miles or so. But there was no point in putting these oils on the market until an oil filter could be developed that would not remove additives. True, a few of these additives are already on the market in limited quantities—but, again, they are ineffective as long as they are being soaked up in absorbent filters.



Another problem with ordinary filter packs is what engineers call "channeling." This happens when hot oil, under pressure, forces holes in the paper or rag the pack is made of. As these channels grow larger, more and larger abrasive particles get through into the oil

stream where they can score and damage rings, bearings and other precision parts,

To solve these problems, engineers had to find a filter that wouldn't soak up valuable additives, but would remove the microscopic abrasives that do the real damage to precision engine parts. These "danger zone" particles range from 10 to 30 microns in size (a micron is 39 millionths of an inch)—so small that several hundred of them would simply rattle around inside the period at the end of this sentence.

Since conventional absorbent filter material couldn't be packed tight enough to stop these tmy particles without reducing oil flow, engineers decided an entirely new kind of filter material had to be developed. Obviously, it had to be metal—but there was no way of making a metal screen fine enough.

Finally, metallurgists found the answer by fusing together millions of tiny metal balls into a porous filter. Being non-absorbent, it wouldn't remove additives, yet abrasives simply couldn't get through the spaces between the tiny metal balls. Made of an alloy that just doesn't wear out, it never has to be replaced!

Original Life-Time Filter Passes 300,000-Mile Test

Samples were rushed to government proving centers for testing. Results: the Life-Time metal alloy filter not only solved the critical problem of filtering liquid oxygen, nitrogen, etc., for guided missiles, but could save the government millions of dollars now spent on filter replacement packs for trucks, jeeps, tanks, etc.

Besides government tests, millions of miles of road tests in truck, taxl and car rental fleets reveal amazing results. Cars equipped with the Life-Time filter have already passed the 300,000-mile mark without over about a of filters.

changing oil filters!

What About Other Metal Filters? Are They Any Good?

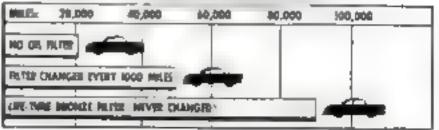
In the last few months, a number of Life-Time "type" porous metal filters have suddenly appeared on the market. Some of them look like the original Life-Time filter, others are experimental designs and "improved" substitutes. Until these can be tested, no one can say whether they are any good or not.

So far, only the original, genuine Life-Time filter has passed the 100-G shock test, ultra-sonic vibration tests and met military performance requirements. And the original Life-Time filter is available only from the Continental Manufacturing Corporation and its authorized dealers. You can't get it anywhere else.

How LEGG-TIME

2-Way Acid Protection Increases Engine Life

MILES RETUEEN OFFRHALLS



Every mile you drive, a certain amount of water gets into your od. The heat of your engine makes this water combine with sulfur in your oil to make sulphuric acid. This acid cats bearings and other precision parts, causing costly damage.

The Lafe-Time metal oil filter actually removes water from your oil. Laboratory tests prove it does this.

In addition, the Life-Time oil filter has a special magnesium insert which neutralizes acids that



250,000 MILES before a major overhaul should be normal with today's engines and oils. Only the Life-time filter meets modern requirements.



DIESEL AND GASOLINE truck fleets have proved value of Life-Time porous metal alloy oil filter in hundreds of thousands of miles of road tests.

news & notes

WOMEN -- YOUNG ONES, ANYHOW -- ARE SAFER DRIVERS than young men. The insurance companies say so, and back their belief with whopping rate reductions in most states. It will now cost papa as much as 23 percent less to let his under-25 daughter drive the family bus than it would to let his under-25 son take the wheel. The insurance people are not reckless enough to say that girls are better drivers -- they may have fewer accidents because they drive less often, particularly during dangerous evening hours...A NEW KIND OF AUTOMATIC HEADLIGHT DIMMER, still experimental, uses a perforated scanning disk to keep out light from the sky and signs, which may fool present dimmers. It responds only to intense points of light, can even be rigged to disregard alternating-current lights (street and house lights) in favor of DC head lamps...AIR-INFLATED SEAT_CUSHIONS in new Chevvy trucks have separate sections, each with its own hand pump, so that driver and passenger can make individual hardness adjustments.

A QUARTER OF ALL BRITAIN'S ELECTRICITY WILL COME FROM ATOMIC ENERGY by 1975, if an ambitious building plan just announced works out. The chart below shows the timetable for the construction of 12 atomic-power

British Electricity Goes Atomic

1957

1959

1961

1962

1963

1964

1965

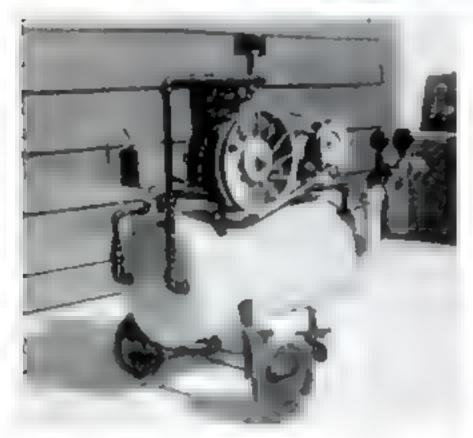
plants over the next 10 years. They will operate at the same cost as coal plants. By the 1970s, the British expect to build no more coalburning power plants. BABY FOOD FOR JET PILOTS? Jet jockeys can't take off their oxygen masks to eat. so the Air Force is testing a soupy mash of bananas to be piped right into the mask. It's something like baby food, but tastes better -- thev sav.

AN UNDERWATER TV CAMERA INSPECTED THE COLUMBIA RIVER BED for Army Engineers planning The Dalles Dam. Previously they had used TV to check erosion at the base of the spillway of Grand Coulee Dam.



CRAFTSMEN AT, WORK

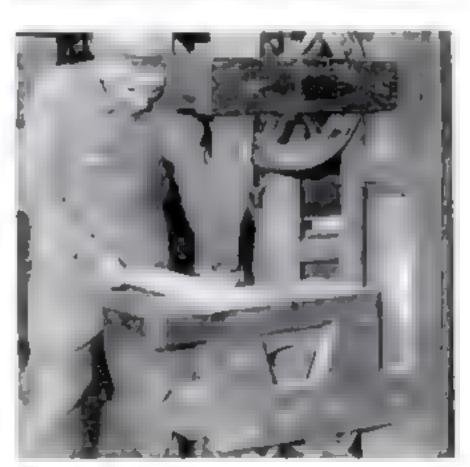
Plywood Jails "Badmen."
Giving in to TV and movie Westerns. Robert M. Kuntz Jr. of South Bend, Ind., built a playhouse jail for his own and neighborhood voungsters. Walls and roof are of exterior plywood. Carriage-bolt as sembly on a frame of two-by fours permits easy taking down for winter storage.



Tiny Engine Develops 10,000 R.P.M. This model-iceboat motor, built by Robert

J. Huelsbeck of Menasha, Wis., has a %" bore and a %" stroke. Except for an aluminum-crankcase easting, all parts are steel or brass made with hand tools and a small lathe. Operation at speeds from 5,000 to 10,000 s.p.m. is with either a timer and ignition coil or a glow plug.

Builds Paint-Spraying Rig. A workshop story in PSM (Sept. '54, p. 241) got William L. Tyner of Glendale, Calif., to experimenting and he constructed a spray-gun outfit using a 2-cyl. compressor. He welded a tank from the ends of two discarded water heaters and covered the stack hole. This left four pipe openings for the air lines, pressure regulator and moisture trap.



Bandsaw Takes 18" Work. Needing a heavy-duty bandsaw, Edison Kirschman of Prairie Home, Mo., built one out of two gas-engine flywheels and a wooden frame. Tension on various-size saw blades used is regulated by a threaded crank and nut which move the upper wheel assembly.

96 POPULAR SCIENCE



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Outdoor America's most exciting discovery . . . TRAILER BOATING! Thousands will tell you there's nothing like it! You can explore famed vacation waters, or whisk your boat to lovely shores in easy reach. From highway driving to waterway cruising is a matter of minutes. Each launching starts a holiday of fresh adventure, new family fun.

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-only 49 lhs. Top value to the ght motor field. IGHTWIN with famed Fisher-eas Dries —3 h.p. 32 bs. It goes nywhere, slows anywhere." \$145 All majors are OHC certified at 4000 PM tested in conformity with SAE at rode. Weights are approximate.

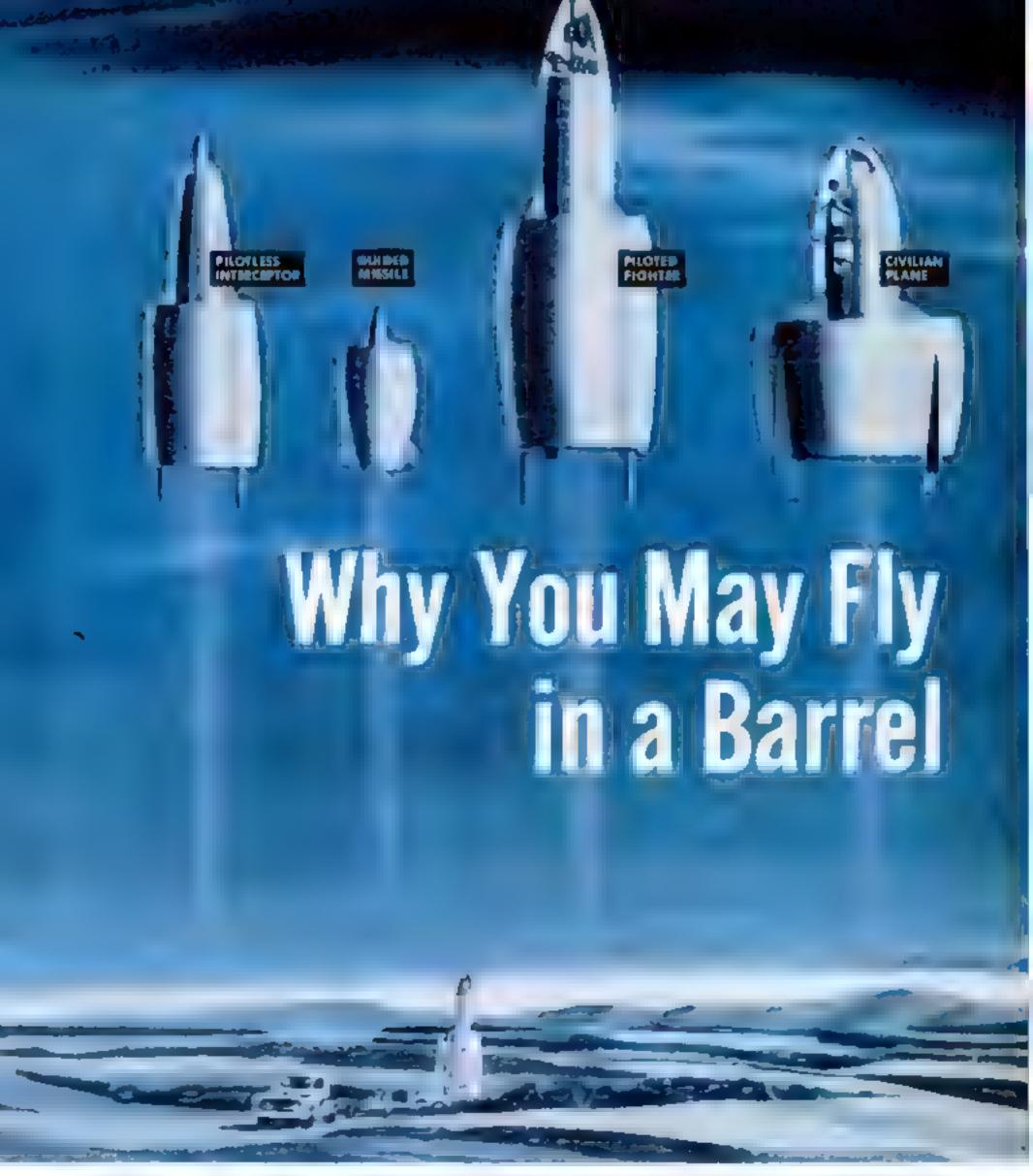
Prices (.a.b. factory sub) set to change filbout solice.



Artist shows coleopter in level flight and, in diagram below, ascending and landing vertically.

Tomorrow's plane, say designers in France, will be a flying engine with a wing wrapped around it.

By Alden P. Armagnac



Principle can be applied in variety of aircraft for many uses, as these four examples show.

THEYRE hatching a sensational mechanical bird in an aeronautical laboratory at Brunoy, near Paris, France. Quivering in gales faster than sound, wind-tunnel models give the spectator an exciting preview of what may be to-

morrow's airplane. The barrel-winged craft looks more like a projectile.

It will take off straight up, like a rocket. Gradually it will level off into horizontal flight. Finally it will up-end itself once more, descend vertically, and alight, as it started, on its tail.

Under development by a French-German group of researchers, the fledgling craft is called a coleopter. An inexact but popular equivalent of its name would be "flying bug." It's a promising new member of the ultramodern family of aircraft designated by the magic initials V.T.O.—vertical take-off.

By matching both the vertical-rising ability of helicopters and the aerial performance of other types, V.T.O. planes would free aviation from dependence upon airport runways and carrier decks. Already the V.T.O. idea has inspired some of the most radical machines ever flown—America's tail-sitting "po-

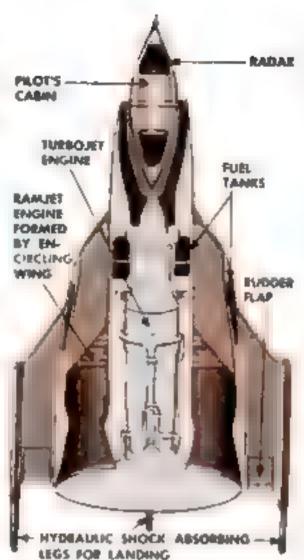
go" planes, England's fantastic "flying bedstead," and vertical-horizontal hy-

brids called convertiplanes.

But the coleopter, with its tubular wing, belongs in a class by itself. Finding nothing like it proposed before, France's Ministry of Industry and Commerce has granted more than a dozen basic patents for its design.

Bending its wing into a circle, its proponents explain, makes a single structural member do the work of two. The wing itself serves as the outer part of a jet engine, or as the duct of a ducted-propeller power plant. By saving weight, the range and payload are boosted. Moreover, a circular wing is strong, easily made and, since it is perfectly symmetrical, ideally maneuverable in the air

For lift in level flight, a conventional plane's wing is mounted at a slight inclination to fuselage and air stream. The tubular wing, instead, is coaxial with the fuselage. So a coleopter supports itself by flying horizontally in kitewise fashion—the whole craft inclined a few degrees upward to the air stream. The



cutaway view of coleopter shows it is virtually a flying engine. Here, barrel wing forms ramjet, to supplement turbojet at center.

lift then corresponds to that of a biplane, whose span equals the diameter of the circular wing.

Coleopters will serve both military and peaceful purposes. Here are examples of projects on the designers' drawing boards:

A guided missile called the Ogre, some six feet long and three feet in diameter, carries a shapedcharge warhead. Its ramjet engine hurls it at 530 m.p.h. to an estimated tactical range of 30 miles.

A pilotless interceptor, the 17-foot Charencon VI, climbs in two minutes to its 65,000-foot service ceiling. A ramjet engine supplements its turbojet power plant to give bursts of 1,300 m.p.h, speed, Radar

and a television eye guide it to the target, which it destroys with cannon fire or rockets. Then it returns to base,

A light ground-attack plane, the 27foot Bruche, flies at 900 m.p.h. under the combined power of a turbojet engine with an afterburner, and a ramjet.

A touring plane, the three-seat Hanneton II, is 19 feet long and has a barrel wing 20 feet in diameter. Two turboprop engines drive tandem propellers, whose thrust is enhanced by the wing-formed duct around them. This 280-m.p.h. plane of 620-mile range would be fast and economical for private flyers.

Occupants of coleopters remain comfortably upright in swivel seats, whether

in vertical or level flight.

For short-to-medium-range air transport, the coleopter is the logical plane of the future, calculations convince a group of backers headed by Helmut von Zborowsky, Austrian-born engineer, and including Prof. Heinrich Hertel, former chief of development at Germany's great Junkers works. Participating with them in developing the coleopter is France's largest aero-engine concern.





Double meet: High above Allegheny River at Aspinwall, Pa., railroad and trucking officials

BY HAULING more than three-quarters of a mile of loaded truck trailers over its main line, daily, the Pennsylvania Railroad may already have added to your driving pleasure. And, if the predictions of its traffic department come true, this one railroad should take 2,000 trailers off crowded New York-Chicago high-ways by 1957.

The Pennsy calls this new opera-

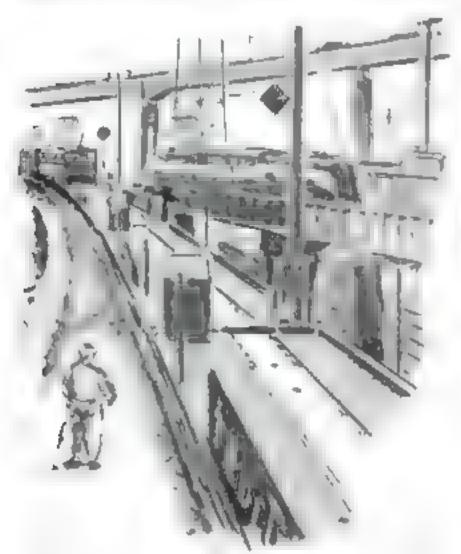
tion "TrucTrain"—on other railroads it's "Piggy-back" or "TOFC" (trailers on flatcars).

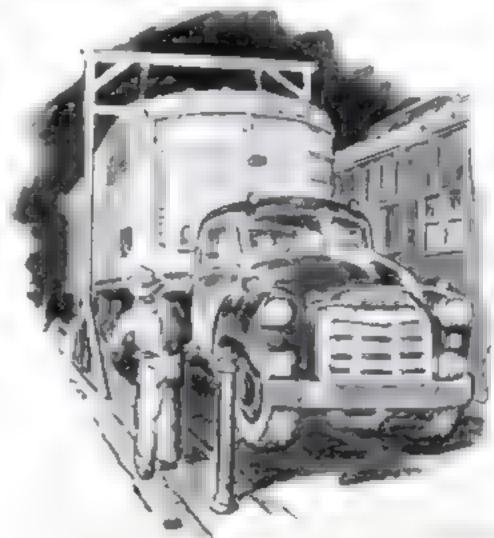
Hauling truck trailers by rail is nothing new; the railroads have been doing it for more than 20 years. The big difference today is that the Pennsy, along with other lines, isn't limiting the service to its own trucks—a setup that competing highway carriers have always fought bitterly.

How trucks are loaded for the world's biggest

LATE IN AFTERNOON, an electric locomotive shoves flatears onto six TrucTrain receiving tracks at Kearny, N.J. Brake staffs and end bridges are lowered so trucks can back aboard.

TRUCTRAIN TERMINAL accepts shipments for Chicago until 10 P.M. Trailers are weighed to determine railroad charge, are then hauled under this gantry to check clearances.





Cross-Country Freight



watch first west- and eastbound TrucTrains pass each other on Pennsy's Brilliant Bridge.

With TrueTrain, any common-carrier trucking outfit can put its trailers aboard a specially designed flatear and have them whisked from New York or Philadelphia to Chicago in 29 hours.

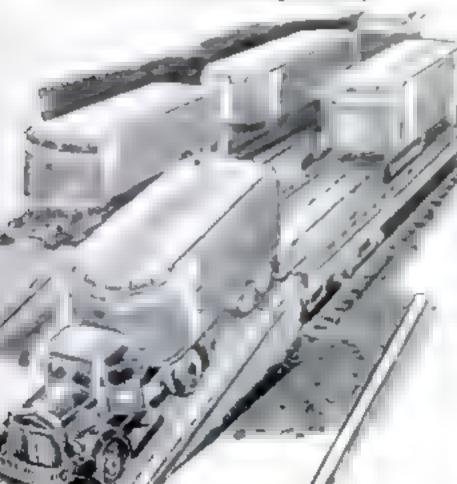
A saving of about 10 hours over present all-highway schedules results. It also represents a slight saving in operating costs. The Pennsylvania Railroad charges \$180 for its 904-mile New York-Chicago

haul when the gross weight of the trailer is under 42,500 pounds.

Given the anticipated traffic, the Pennsy believes that TrucTrain should net \$100,000,000 annually within the next five years. Some optimists are even willing to bet that with this closely integrated shipping service, the old-time railroad freight shed may soon be a thing of the past.—Henry B. Comstock.

piggy-back ride—New York to Chicago in 29 hours

MOTOR CARRIERS' TRACTORS are uncoupled, and special, railroad-leased trucks back trailers up concrete ramps and onto flatears. Shipments are now the railroad's responsibility.



TYING A TRAILER to a flatear deck is a fiveminute job. Screwjacks, fore and aft, lift trailer weight just off the wheels; turnbuckle-adjusted chains provide counter tension



How They Produce Cars Nowadays

Take a look at a modern assembly line. In this cross between an army beachhead and a circus, your sedan draws its first breath.

By Frank Rowsome Jr.

AUTHOUGH mass-building cars is one of America's particular talents, the process is strangely unknown. Ask a man how he thinks his car was made and you'll likely get some shadowy images compounded of the Model T line 30 years ago and Charlie Chaplin being flummoxed by a monster machine. Actually, auto building has changed as drastically as cars themselves. Automation, new stamping and welding processes, and the steady refinement of assembly techniques have all reshaped the 1955 lines.

If you were to spend a week on a production line, you would no longer consider the familiar sedan in your garage a loyal but highly individual baby. You'd see it, instead, as a tricky contrivance of sheet metal, iron and glass—a bundle of nasty problems neatly solved.

You'd see it as something that was born in a couple of noisy hours, created by perhaps 2,500 pairs of hands, many of them female. You'd realize that its shape and behavior weren't just the doing of designers and stylists, but were controlled by inexorable laws governing what can be done quickly on an assembly line. You'd discover, too, that although your sedan may be as distinctive to you as a favorite fedora, skilled people worked hard to keep it from having any more individuality than the third egg from the left in a carton.

Nash-Hudson plant. The American Motors factory at Kenosha, Wis., is a good place to see new-style car building. Nashes. Hudsons and Ramblers are intermixed on the same final line there. If you count by major engine differences, this plant simultaneously manufactures six different kinds of cars. All these cars have "single-unit" bodies, which means that the classic dodge of slapping a frame on a conveyor and then screwing bits onto it won't work—because there is no separate frame.

This plant is geared to crank out 1,000 cars a day. Although other plants are bigger, it is extremely large. Everywhere inside the gates you detect a big-league approach. Eight or 10 enormous factory buildings sprawl across the landscape; a six-stack powerhouse hums with kilo-



TEN MINUTES OLD, this car, one of a thousand built each day, is about to graduate into the workaday world. Men shown are final inspectors

who check hundreds of points on each car; more than half of them are in the pits underneath. Mechanism in foreground aligns the wheels.

watts; miles of railroad sidings snake between and through buildings; block-long queues of big trucks wait, bumper to tailgate, for their turn at the unloading docks.

The yards have the organized semiconfusion of a beachhead on D plus 3. Inside, you find that squirreling stuff away against the moment when it will be needed is a major part of the job. Racked engines and transmissions, heaped front ends, and mountains of wheels fill floors of big buildings, because a mass-production line is really a kind of gigantic and exacting cafeteria. Sad is the lot of the cook who doesn't have his chops—or castings—ready.

Central nervous system. Tucked off in a corner you find the offices of Al Pryse, a harried but courteous man who, with about 16 assistants, functions as the factory's central nervous system.

An order for a car is relayed from the dealer to Zone to Sales to Mr. Pryse. Knowing what kind of car is to be built, of what colors and trims, with what engine, axle, transmission and major accessories, his office then sends out instructions to each of the 26 places in the factory where different characteristics of a car are established.

At many of these remote places, workers load up subconveyors with the ingredients for this particular car. The subconveyors move in a synchronism calculated to bring each part to its own spot on the final line at just the right instant for the ordered car to flow together.

Major parts for the three makes come



PULLING STRINGS installs windshield. Man outside holds glass (already fitted with rubber channel) against opening. When loop of cord is pulled, rubber snaps around steel edge.

into Kenosha from all over the map: Hudson six-cylinder engines from Detroit, V-8 engines from Utica, Mich., big Nash and Hudson bodies from Milwaukee, and smaller bits from scores of places in the nation. The scheduling office makes sure that the right parts for your car reach the right spot at the right time.

Subconveyor lines hold different carfuls of parts. A front-end conveyor line, for example, is loaded up 200 cars away from final assembly, whereas other lines may be loaded 100 or 75 or even less cars back. This means that toward the end of a day, some pipelines are sequence-loaded with materials that are going to be used today and others with parts that will not be needed until tomorrow.

Scheduling instructions go out in code numbers on telautograph machines, complex gadgets that reproduce writing at the 26 locations about the factory. But they don't beautify a man's handwriting, and if a carelessly written code 7 is misread as code 1, trouble can come popping.

"It sounds complicated," Mr. Pryse tells you with a smile, "but it works fine. Once in a blue moon somebody goofs and the wrong-colored wheels get loaded on the conveyor. We switch 'em later. Or maybe a car that's ticketed for an automatic transmission gets built with manual shift. The factory queries Zone to see if they'll accept it, and usually they will."

"With three different makes having six different engines all being built simultaneously, don't you ever accidentally put together a freak?"

"Nope. The system's pretty foolproof. Besides we really couldn't go far wrong

—the parts wouldn't fit."

Cave of the welds. Next stop is where they build Rambler bodies, a vast and thunderous structure about as cozy as a dirigible hangar. It is a noisy, smoky cavern, peopled by goggled men (a few women, too) and by Indian files of big stampings marching overhead on conveyors. It's a place where you momentarily expect to be hit on the head from behind. Body fixtures—shapeless steel holding frames, covered with cam-locked clamps—march slowly along in orderly patterns over the floor,

The form of a car appears on them before your eves: first the intricate underbody, then the "unisides" complete with doors and window openings, and then the big dished roof. It grows by several kinds of welding-are in high-stress places, oxyacetylene for awkward locations, spot welding wherever practical. Mostly, great lobster-clawed spot welders bite the steel together in spurts of sparks. Elsewhere on the floor, grinders, inspectors, fillers and finishers swarm over the pewter-colored steel bodies as they inch along.

All the trimmings. Upstairs the bodies are cleaned, treated to prevent rust, and spray-painted-in part by darting automatic guns that squirt only when they "feel" a body going by, Twotoning calls for deft masking, not in the take-hours fashion that you or I would do it, but in fractions of a minute, using shaped aprons of cloth edged with adhesive. In the maze of mechanism it comes as a surprise to see occasional delicate handwork, as when wood-grain decals are adeptly stripped onto station-wagon panels.

Everywhere you see planning and defeness: when a girl or man needs a power tool, there it is floating in space a few inches away from the hand. Some workers take a 30-foot ride within each body; some lean in the open doors, their feet neatly pacing the moving line; some hook on little castered seats and are towed along as they work. Windshield and rear-window glass, enclosed in rub-her channel, is zipped into place within its metal frame when an encircling cord is pulled off, like the red tab on a pack of cigarettes. Then the finished bodies, calked and sealed, glide off to another building to meet their machinery.

Horsepower nursery. In the large buildings where engines are born the air is one of no-nonsense exactness. Parts fit just so, with no fiddling. Blocks from the foundry roll into elaborate face-bore-drill-ream machines that not only assaulthem with furious precision but also call for help if anything goes wrong. Engine build-up takes place on parallel moving lines: In go balanced cranks with flywheels and clutches pre-attached; in go rods and matched piston sets; on go cylinder heads, torqued up by nut runners.

AUTOMATIC GUNS do part of painting job. Three shown dart rapidly back and forth on curved

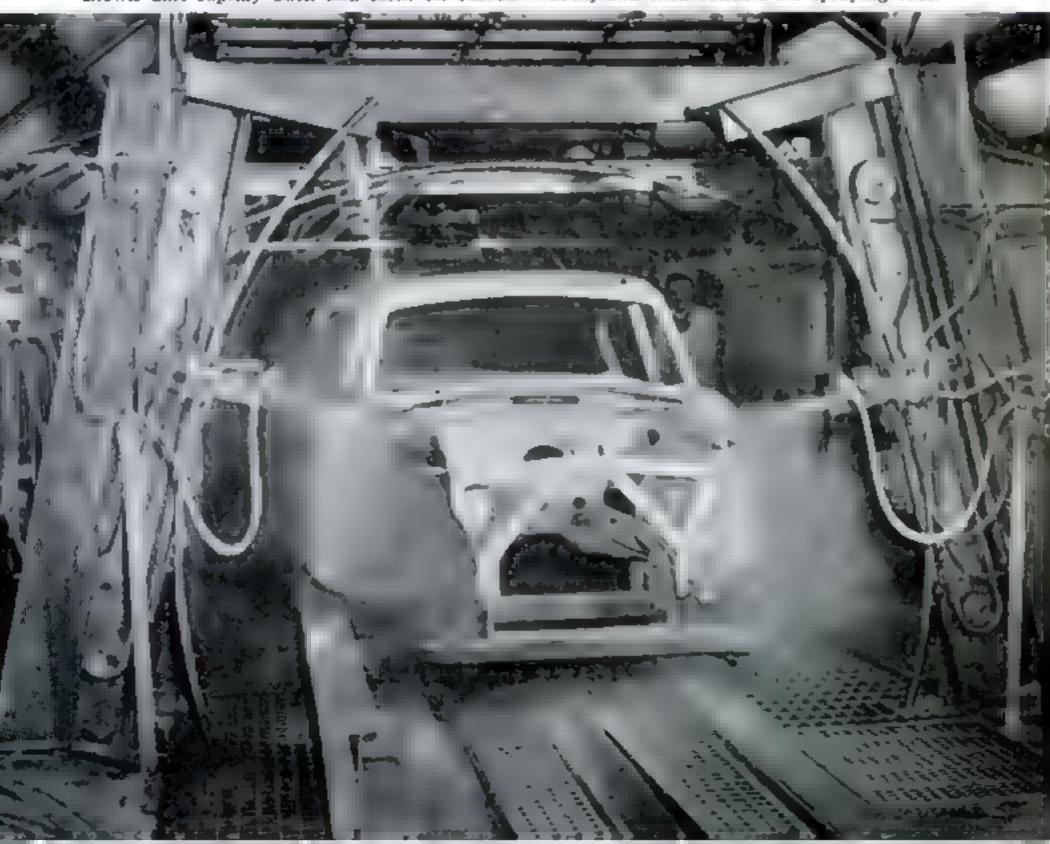
In Motor Test a man prepares a newly built engine for its first independent breath. In a few seconds he fits on water and exhaust lines, clips on a wire, swings a drain pan under the unplugged crankcase, and hooks a flowing oil pipe to the filler. (Any errant foundry sand or machining chips are flushed away.) On the carburetor throat he slaps a fitting that feeds cooking gas to the engine (it's safer indoors than gasoline), and touches the starter.

The engine starts. Instantly. Watching engines go by there for an hour, you note that they always start. "Well, why shouldn't they?" a workman savs matter-of-factly. "Until the laws of physics get repealed, they can't help starting." Each engine runs at a brisk idle for 20 minutes, not for break-in but for hot setting of valve lash and spark timing

The big show. Elsewhere complicated lines are turning out rear axles, transmissions and steering gear. But a visitor

[Continued on page 254]

tracks. Top one automatically drops to do rear deck, and then retracts for spraying roof.



l'alike to see them make...



A GLOVE-COMPARIMENT LOCK wired to the car's ignition system. Electromagnetic, it would lock automatically as the motor is turned off.—

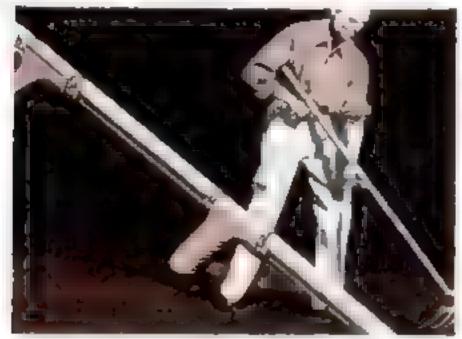
Pet. D. J. Martinson, Ft. Belvow, Va.



A MAGNIFYING GLASS that could be worn on a fishing cap and swung down before one eye to leave the hands free for tying flies onto a leader.—I. G. Aylicard, San Diego.



BUTTONS AND BUTTONHOLES on cloth strips for mending work shirts and coveralls. They could be sewed in place or fronted on with adhesive.—W. 1. Kaser, Baltic, Ohio.



GARDEN-TOOL HANGLE GRIPS shaped like a pistol butt. They could be made of plastic with a metal collar for fastening to the wooden handle.—B. M. Franklin, Hunter, Okla.



A LAWN MOWER WITH A HANDLE that folds in half for carrying up basement stairs, then locks rigidly at full length for mowing.—Charles E. Mieros, Grand Haven, Mich.

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas disstrated above were suggested by Poethan Schwen Vontent renders. What

in yours? We will pay 35 for each one published. Please use Concernment posts and only. Write name and address clearly. Contributions cannot be acknowledged or returned



MIGHTY 1,000-TON PRESS makes diamonds in huge General Electric Research Laboratory. The two-story-high machine applies terrific pressure and heat to ingredients, in pit beneath openings in floor. For safety in case things fly, workers leave pit and run press by controls elsewhere, such as wheel on which man's hands rest at lower right of this picture.



COW BARN houses diamond-making plant of Vilella and Tomarkin, seen standing in doorway leading to modest 300-ton press with which they turn ordinary carbon into tiny gent stones.

Diamonds Are Where You Make Them

Success has crowned science's efforts to duplicate nature's prized gem in the laboratory.

By Herbert Yahraes

DIAMONDS have cropped up in odd places—among them, the eye of an Indian idol, the farm of a poor Dutch settler in South Africa, and certain meteorites. But for sheer unlikeliness, nothing beats the spots where the newest discoveries have been made.

One of these new diamond mines is in a famous laboratory. The other is in a cow barn. Adventurous scientists in both these places have finally succeeded in



THIS BLACK STUFF, carbon from sugar, is raw material for diamond makers Vitella and Tomarkin. Batch shown above, they say, is enough to yield at least 25 carats of diamonds.

AT CONTROLS of their apparatus, Tomarkin (left) regulates current supply, and Vilella turns handles that operate the press, partly visible in the foreground at extreme right.

making diamonds—no mere imitations, but real ones.

You wouldn't stop to look twice at the new stones—all except one would be classified as diamond dust, and even that one weighs less than 1/100 of a carat. Another stone nearly the same size slipped away from someone's nervous fingers and was lost forever in the dust on the laboratory floor.

You could buy an equivalent amount of the diamonds produced so far—hundreds in each place—for perhaps \$10 or \$20. But the potential value of the processes for making them is enormous.

When General Electric held a press conference in mid-February to announce its achievement, a uniformed guard kept watch as reporters looked at the stones through microscopes. And the scientists in the cow-barn laboratory—who claim to have made diamonds before GE—have worked on a secluded estate protected with floodlights, watchdogs and a rack of rifles hanging near the diamond-producing press.

Diamond making has been one of man's recurrent dreams because these rare and precious stones are composed of carbon, and any organic material—a bone, a stick, a piece of wool—can be reduced to carbon simply by charring. Graphite in your pencil is carbon; so, mostly, is coal.

The difference between cheap and costly kinds of carbon lies in how their atoms are arranged. Immense heat and pressure can change the atomic pattern, or lattice, of ordinary carbon into that of the diamond. Deep in the earth, nature probably made diamonds that way.

Some 75 years ago a young Scotch chemist, James Ballentyne Hannay, tried to do the same. Into a heavy wrought-iron tube he poured hydrocarbons, bone oil and lithium. Then he welded the tube shut and threw it into a furnace. Eighty times he performed this dangerous experiment.

Most of his tubes exploded—like cans of beans in a bonfire—under the terrific pressure built up as they became red-hot. Three tubes held. They yielded tiny fragments that 25-year-old Hannay claimed were diamonds. Other investigators, however, had no success when they tried his method.

A later, more celebrated attempt, by Henri Moissan in France, stemmed from the observation that some meteorites contained trny diamonds. To duplicate what had happened in space, Moissan



ALUMINUM CHAMBER, being inserted in press, contains ingredients to be subjected to big squeeze. Electric current, fed through cable meanwhile, raises them to high temperature.

AFTER THE SQUEEZE, Vilella slices chamber open with ax blade, and Tomarkin examines product—in this case, a metal alloy. Diamond-making chambers are smaller, but procedure is same.

first dissolved carbon in molten iron. Then he plunged the white-hot solution into a cooling bath.

Sudden chilling from the outside, he expected, would make the solidifying material contract, and exert pressure on

the hot inside. And when he dissolved away the iron of his miniature meteorite, he found what he believed to be microscopic diamonds, crystallized from the carbon.

Moissan went on to win the Nobel Prize in 1906 for his discovery of fluorine and his development of the electric furnace. But whether or not his "diamond" crystals really were diamonds is still disputed.

Today's diamond makers owe most to another Nobel Prize winner, Percy Wil-

liams Bridgman of Harvard. When Bridgman began his work, the highest pressure a scientist could reach and measure was something like 75,000 pounds per square inch (psi). Bridgman extended this to the almost unbelievable figure of 6,250,000 psi.

The Harvard physicist was engaged in pure research. He didn't set out to do anything that would have immediate practical value; he harnessed high pressures because they were a tool for investigating the structure of matter.

Strange things, Bridgman demonstrated, happen in the world of the supersqueeze. At 30,000 psi, for example, water freezes not at 32° but at eight below zero. Furthermore, a new kind of ice appears—one that is heavier than water instead of lighter. As the pressure increases, still different kinds of ice are formed: six altogether.

Carbon, in the form of graphite, was one of the materials that Bridgman worked with. He was curious, of course, to see if he

could turn it into diamond. So were three commercial companies—General Electric. Carborundum and Norton. With their financial support, he developed apparatus that enabled him to put graphite under pressures as high as 450,-000 psi, meanwhile subjecting it to enor-



GE DIAMOND 1/16 in. long, at bottom of magnified view, is compared to diamond phonograph needle.

mously elevated temperatures in the

neighborhood of 5,000°F.

He made no diamonds, but he did show under what conditions of temperature and pressure diamonds would turn into graphite, and he was confident that the reaction could be reversed. "Further experiments," he reported in 1946, "are obviously called for."

A team of seven men was put to work

at General Electric's vast research laboratory, at The Knolls, outside of Schenectady, Their mission: diamond making The work began in 1950 under the supervision of Anthony J. Nerad, manager of the laboratory's mechanical investigations section, "When we started it," Dr. C. Guy Suits, GE's director of research, remarked recently, "I had the conviction it was as close to challenging the impossible as anything could be." But Nerad and Suits both knew that, even if the company failed to make diamonds, the experiments

might lead to other valuable products. For the diamond makers, the company bought a 1,000-ton hydraulic press, ordinarily employed for such jobs as molding metals. Such a press has a large ram—about 20 inches in diameter—but to reach superpressures the entire force of the ram must be concentrated against a time area.

a tiny area.

In Bridgman's work with graphite, the rain acted against a thin piston, and the piston, in turn, bore down on the contents of the pressure chamber, which was 1½ inches in diameter and several inches long.

The walls of the chamber were made of specially treated steel and were surrounded by a supporting block made of five steel disks, each two inches thick. Even so, the tremendous pressures some-



HOW BO THEY KNOW they're diamonds? X-ray diffraction "fingerprint" of GE gem, above, clinches verdict of other tests.

times cracked both the central vessel and the surrounding block.

GE scientists ran into the same trouble. How they solved it is a trade secret, but they've been making their diamonds in a smaller chamber ringed by thick, concentric bands of metal, possibly a new alloy. Electrical heating can maintain a temperature of more than 5,000 within the chamber for a long period.

In this small chamber the scientists placed a carbonaceous material." It may have been largely graphite, which Bridgman used; charred sugar, which Moissan used; or a variety of other carbon-containing Real diasubstances. monds often contain some ash, made up of the oxides of various metals — iron, calcium, magnesium, aluminum, titanium—and of silica. So the scientists may have added a dash of similar ingredients.

The early years brought many setbacks. Some were easy to explain—for example, a

chamber would crack because it simply wasn't strong enough to withstand the pressure and heat. But for others there was no quick explanation. Earlier workers had calculated that graphite ought to become diamond under great heat and at a pressure of something like 450,000 psi. But to find just the right pressure and temperature—and just the right length of time to apply them—the scientists had to progress by trial and error.

Finally, one day last year, a 46-yearold physicist, Dr. Herbert M. Strong, removed the pressure chamber from the 1,000-ton apparatus, opened it, and found that the contents had solidified. That was an old story. But when Strong took the hard little capsule that had once been a soft "carbonaceous material"

[Continued on page 264]



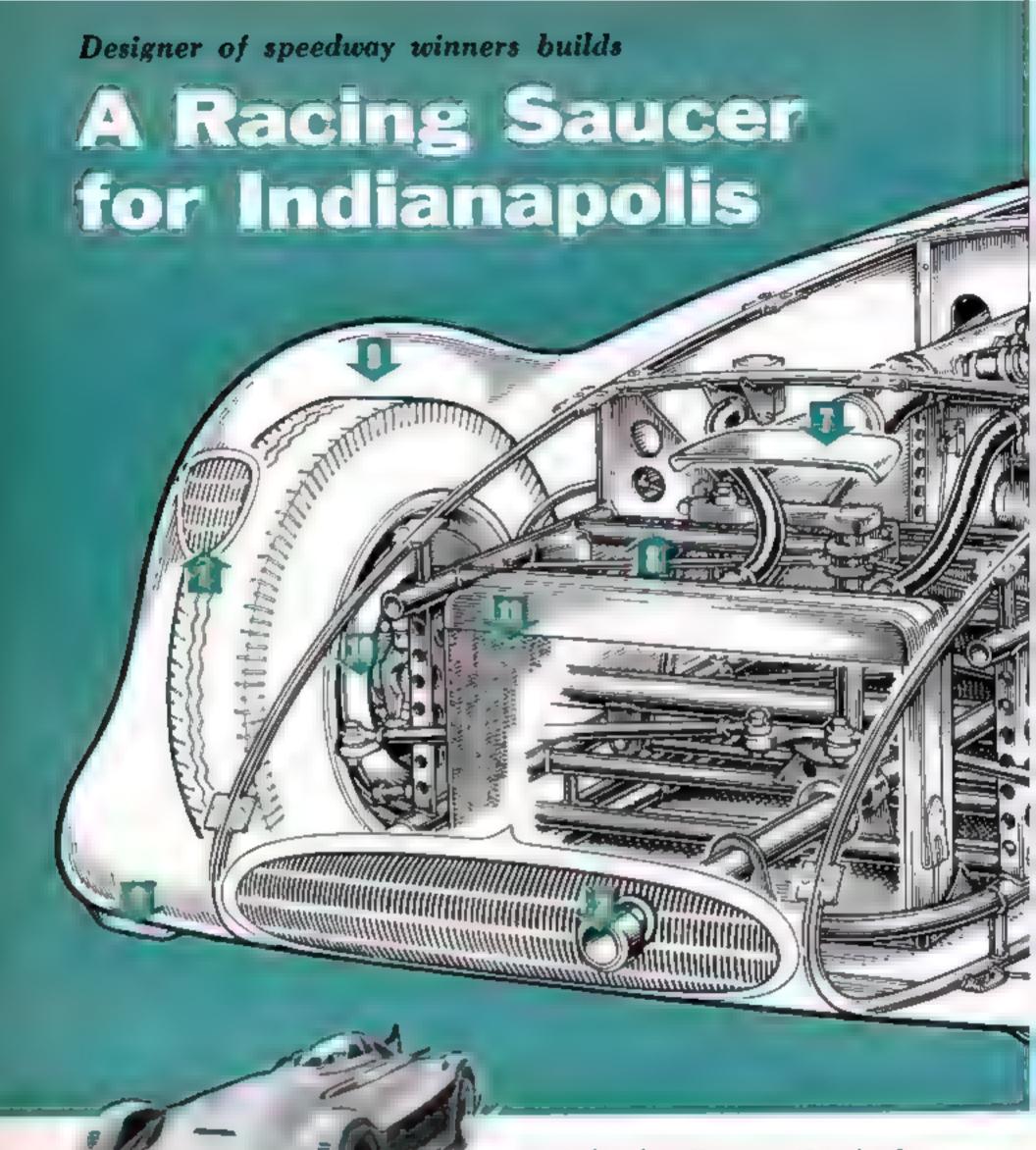


Plastic Bubble, Swimming-Pool Size, Hides Radar

IT TAKES the biggest plastic part ever made for an airplane to cover the underslung radar antenna on one of the Air Force's picket planes. These Super Connies, crammed with six tons of electronic gear, recently began patrol off the Atlantic coast.

From their guard lines high in the air, they detect aircraft many hundreds of miles farther away than land-based radars can

The giant bubble-ample for a family swimming pool-consists of two pieces joined together. Zenith Plastics Co. makes it



By Ken Kincaid

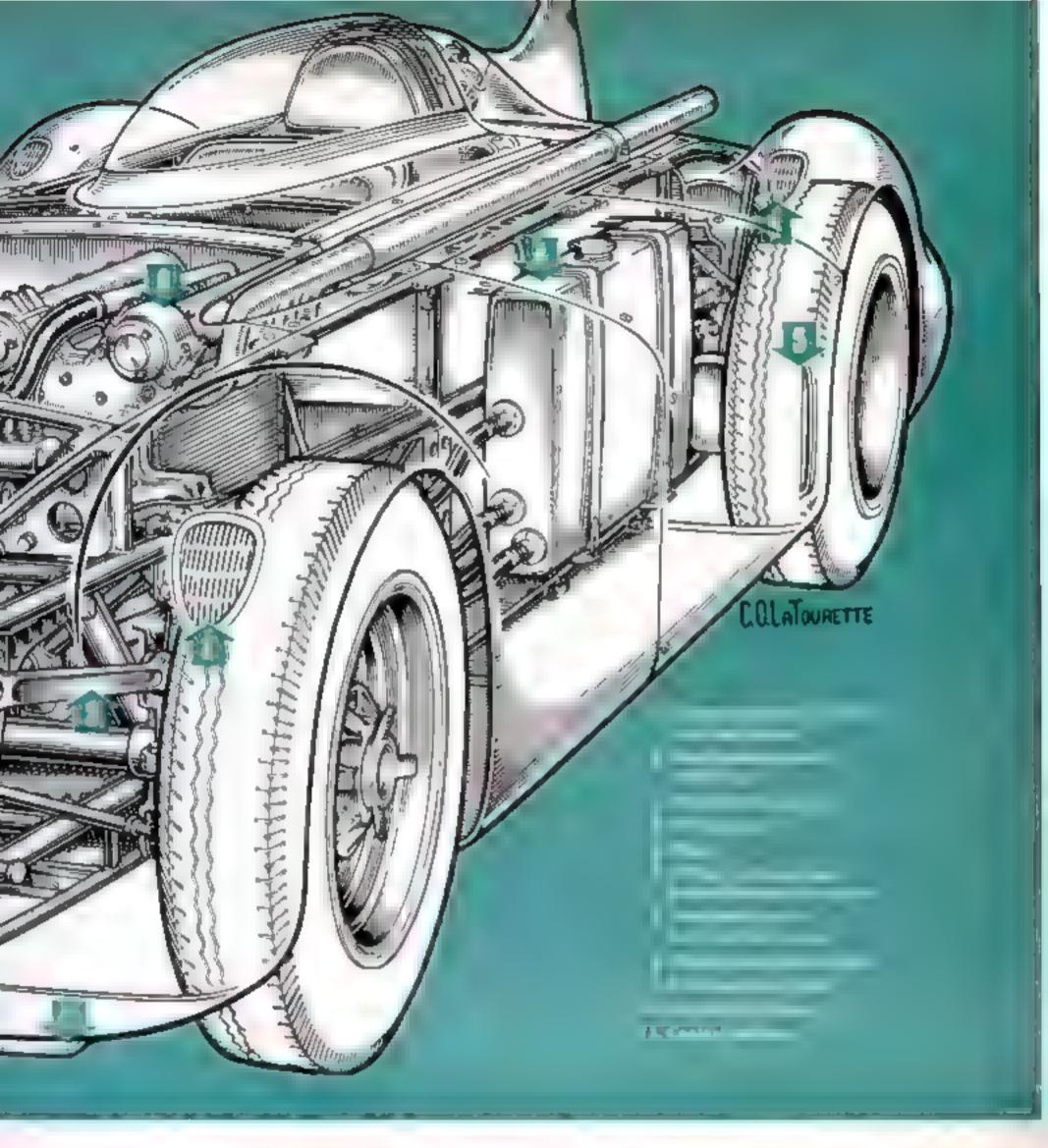
Day race at Indianapolis, The soft-spok-

of U. S race-car builders. He has seen his creations lead the field more often than a wone else in recent racing history

This year instead of betting on the sure thing that his cars have become he's taking his chances on a new and radical design—a folly streamlined our Win or lose at will be worth watching.

It is as startlingly different-looking as

14 FORMAR SCIENCE



a bit tail fin and a plastic bubble over the driver

Last October, Kurtis first outlined his idea for this car to millionaire sportsman Chapman Root of Terre Haute, Ind.

"It'll either be a bomb or an outright dud," he told Root, "But I think it'll really fly."

"You build it." said Root, "I'll buy it

a flying sancer. It has enclosed wheels, hurtis has acted on the theory that if a little streamlining is good, a lot should be better. But complications result from improved streamlining

> Take, for example, the question of enclosed wheels. The exposed tires and brakes of an ordinary racing car are obviously responsible for a lot of wind drag. But tires and brakes take brutal punishment in a race. Plenty of fresh

cool air can save them from quick destruction. Chopping off the unlimited supply of air they get when they're ex-

posed may be risky.

Kurtis feels that he has licked this problem. Above and below the tips of his car's front fenders, he has built openings that will admit huge amounts of fresh air to draw the heat off the front tires and brakes. The air then is guided into wide tunnels to cool the rear tires, brakes and rear-axle assembly.

Streamlining creates other problems, too. The more a car is streamlined, the less you can expect wind resistance to help slow it down. So the Kurtis-Root car will put a greater load on its brakes than previous Indianapolis cars. To minimize this disadvantage, Kurtis is using a new type of aircraft disk brake, with twice the usual friction surface.

The bubble over the driver's seat will counteract the wind drag of the traditional open cockpit. But, in a race, the car ahead may spew enough oil on the bubble to make it impossible to see through. So it would be dangerous in competition. Kurtis knows no reason, though, why the canopy can't be used during qualifying trials, when only one car at a time is on the track, and when the all-important starting positions are determined

A front position in the starting lineup of the Indianapolis "500" means that the driver will have an easier time blasting through the fantastically fast and crowded first turn, and have less traffic to contend with as the ranks of cars stretch out. Kurtis figures that using the canopy should increase his car's speed by around a half of one percent.

This may not sound like much, but it's seven-tenths of a mile an hour, and start-

ing positions are often decided by bare hundredths. For the "500" itself, the bubble will be replaced by a low windscreen.

The big fin that tapers back from the streamliner's headrest will probably strup hot arguments among the railbirds at Indy. Many of them are likely to think that it's a "stabilizer," like those used by straightaway record cars to keep them on the beam. But Kurtis maintains: "It's no stabilizer, I call it a 'spoiler' and I

hope it works."

The big man whose cars have ruled the roost at the Speed-way suspects that the vacuum that fills the wake of any fast-moving object cuts down the car's aero-dynamic efficiency. So he has designed his streamliner's tail fin in a way that will partly spoil the creation of a trailing vacuum.

"Maybe it's just a wild guess," he says, grinning, "but any-

how I like the way that fin looks. It could mean a whale of a lot."

How big a difference the fully streamlined body will really make will not be known until driver Jimmy Daywalt takes the car around the Indy oval at thundering full throttle. Then the answer will be clear. Kurtis will be running five other brand-new racers that are practically identical to the streamliner except for the wheel-enveloping aluminum body. Like "controls" in a scientific experiment, they will put the finger on any advantages resulting directly from better streamlining.

Kurtis expects the streamliner to be faster by at least two percent, or nearly three miles an hour per lap. If Kurtis and Root, who has an initial investment of \$25,000 in this car, have guessed right, big-time racing will never again be the same.



FRANK KURTIS shows how exhaust header on Offy engine will occupy unorthodox position, rising upward alongside cockpit. Cooling air will keep heat from driver.



This X Ray Uses Hot Atoms

RADIOACTIVE isotopes created in an atomic furnace now make possible lightweight casy-to-carry X-ray machines

An experimental Army unit (above) uses "self-developing" film that requires no dark room. After exposure, a pull on a tab releases themicals to process the picture

A civilian version (right), called the Iso-X, is made by Latton Industries, 336 N. Football Rd., Beverly Hills, Calif. Both machines use radioactive thulium to generate their X rays.



Sea Serpent? Just a Gray Whale

Like a weird sea monster, a gray whale hobs his head above water for a suspicious look at the photographer, Raymond M. Gilmore of the Fish and Wildlife Service. He chased the 40-foot animal in an outboardpowered rowboat to get his pictures.





Camera Guards Robot Toligate

You can't short-change the mechanical toll collector just installed at New Jersey's Garden State Parkway. Put any less than 25 cents in the hopper, and a camera in the box atop the sign snaps a photo of your heense plate as you drive off.



DOUBLE-TANKER is ready for trial run, with driver in his twin hull. Spider gears link en-

gine to rear axle. A 50-pound battery behind the driver belps balance engine weight.

Siamese-Twin Hot Rod Guns for 260

A PAIR of F-84 sirplane drop tanks skimmed the surface of a California dry lake not long ago at 150 miles an hour. A man rode in one, a cut-down DeSoto engine in the other. Chrome-moly tubes and two rigid axles encased in more tubing linked the tanks together.

Howard Johansen, a Los Angeles cam maker, built the car to test the speed possibilities of twin bodies, with their reduced wind resistance. The car's 1,500 pounds pushes into the wind a frontal area of only seven square feet, about half that of a conventional hot rod. Johansen figures he'll top 260 on long straightaways.



UP FRONT, leaf springs from a Hudson suspend the body. The hydraulic line leads to a Dodge front-wheel brake. Installed at the rear, which is springless, are spot brakes from an F-80 fighter and the differential housing which Johansen took from a '34 Ford.

opened power Hull shows fuel tank behind engine, a DeSoto sleeved down to 257-cubic-inch class. Magneto ignition sparks engine which is controlled by driver through a push-pull cable. That s builder Johansen with the hat, checking his engine.

You'll Like



Capital is the first U.S. line to go turboprop.

Turboprop Flight

A veteran air traveler takes you with him on a new kind of liner now flying U.S. airways.

By Herbert O. Johansen

N MY first flight in a Vickers Viscount turboprop, nine beautiful stewardesses vied with each other to keep me-the only passenger-comfortable, well fed and happy as we sped

440 miles an hour, 27,000 feet up. Beautiful stewardesses in abundance are not a characteristic of the turboprop.

They were along because it was a training run, between Winnipeg and Toronto, arranged by Trans-Canada Air Lines before putting the first of 22 turboprop air-

liners into scheduled service.

My preview flight was made about a month before a Viscount was to whine down to a landing at New York Inter-

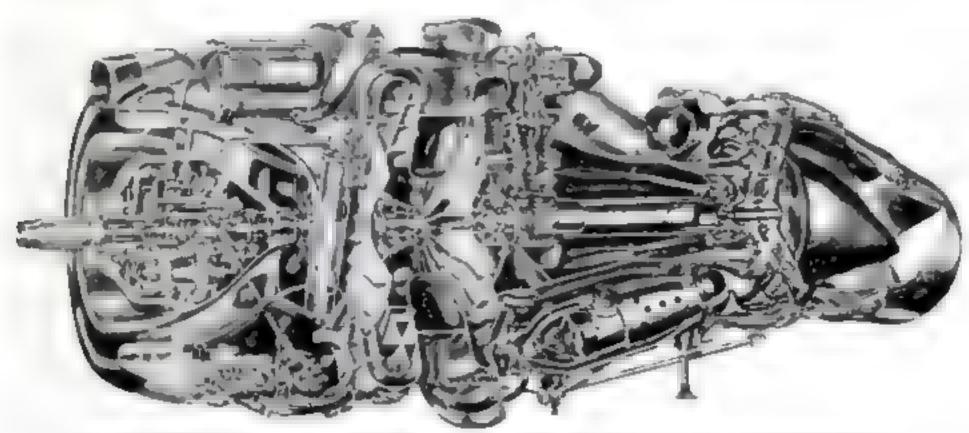


Here's what makes plane go. Vickers Viscount airframe was designed around these engines.

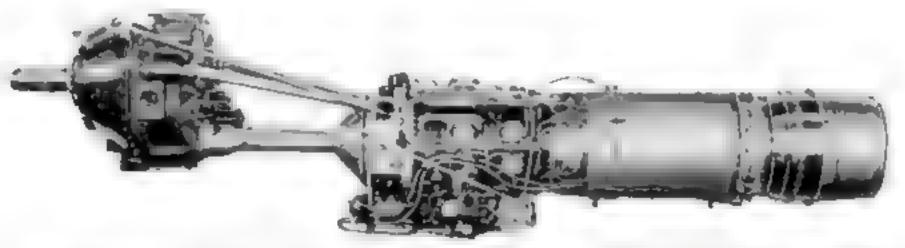
national Airport, introducing turboprop service to the United States. More air travelers in this country will soon become familiar with that characteristic whine as Capital Airlines replaces its entire fleet of piston-engine planes with 60 of the British-made Viscounts.

Although I have flown hundreds of thousands of miles in almost every type of airplane, this flight was a unique experience.

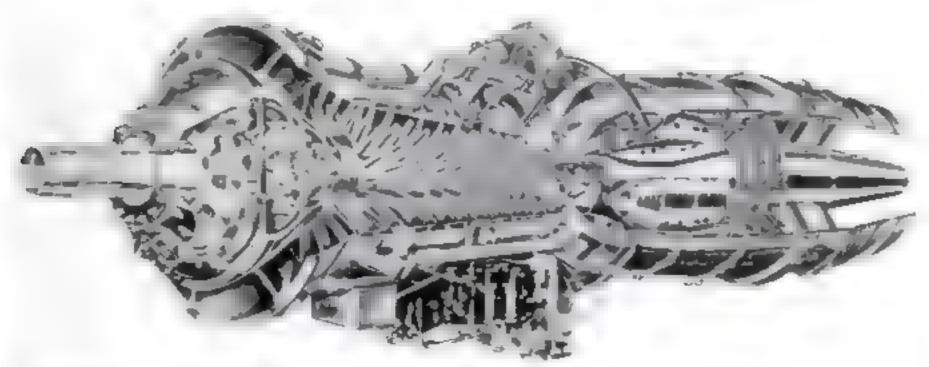
Our pilot climbed to 27,000 feet to get above bumpy weather and to take advantage of a 100-mile-an-hour tail wind.



Four of these British Rolls-Royce Dart gas-turbine engines power the new Vickers Viscounts.



A gas turbine, too, Allison engine above may run tomorrow's U.S.-built turboprop airliners.



Another U.S. contender, Pratt and Whitney PT2, turboprop-powers Navy Super Connies.

Turboprop power enabled him to climb 1,800 feet a minute—about twice that of a similar piston-engine plane. Thus we were able to get up there quickly enough to make it worth while for the short distance to our next landing.

The Viscount's cabin, pressurized to a comfortable 7,000 feet (no ear buzz and my Zippo cigarette lighter worked perfectly), kept us from noticing the altitude. The four 1,500-horsepower Rolls-Royce Dart gas-turbine engines, with a normal cruising speed of more than 330 miles an hour, combined with the strong tail wind, let us cut almost in half the scheduled piston-flight time between Winnipeg and Fort William-Port Arthur airport.

An increase in speed that will, on regular runs, cut half an hour off a two-hour hop is certainly a feather in the Viscount's prop. But what impressed me most about my turboprop flight-let's forget those hostesses now-was the low level of vibration. There was some vibration, of course, but still I did (as advertised) balance a pencil on end. The greatest boon of this lack of the flying shakes, however, was that I was able to sleep, something I have rarely been able to do before on short flights. And there was plenty of room to stretch out for sleep in this 40-seat, two-abreast version. Capital has announced a 48-seat version.

Turboprop flight is the next thing to jet flight. The Viscount's gas-turbine engines are the same type that speed supersonic jets. The main difference, aside from less power, is that the energy is harnessed to propellers as shaft horse-power instead of being blown out through the tailpipe as jet thrust. With only one big moving part, and that rotating, far less vibration and noise is transmitted to the fuselage than with piston-pounding power plants.

"Noiseless," like "vibrationless," has been loosely used in describing turboprop flight. Of course there is noise. In fact, sitting by the window on the port side of the Viscount in flight, I asked a Trans-Canada representative, "Stan, what's all this about no noise? I don't



sig, OVAL PICTURE WINDOWS make it unnecessary for Viscount's passengers to crane their necks for a view of the scenery below. Light reflections make the glass look fuzzy.



"LOOK, NO VIBRATION," says Trans-Canada stewarders Muriel Ryan. She is balancing a pencil on end for me in the aft galley of the Viscount during our preview flight.



THERMOMETER READ 20 BELOW as we deplaned at Winnipeg. That is why Trans-Canada is using a special cold-weather fuel. Capital Airlines' turboprops will burn ordinary kerosene.

"Well, it's a different kind of noise,"

he said, "You'll get used to it."

Only then did I become aware that Stan was sitting at the window seat across the aisle from me. I had talked in a normal voice. There had been no cupping of ears, no "Eh, what was that you said?" And when we stepped off the Viscount on our arrival at Winnipeg, I found that I wasn't shouting at the people around me for the next half-hour.

Now that Trans-Canada and Capital have settled the question whether passengers would be able to fly jet or turboprop first in this country, the question takes a new form: "Will we see more turboprops on U.S. airlines before a commercial jet transport comes along?"

The answer is yes.

Faster four-engine

planes to replace twinengine equipment on
short-to-medium hauls

for which the turbo-

prop is a natural—are being sought by several airlines. When British European Airways put Viscounts on its continental routes, they hogged the business.

American Airlines, our biggest, is eager to get a turboprop for short and middle distances, as well as a turbojet for long range. What American wants for the short hops, as a replacement for its two-engine Convairs, is "a four-engine airplane capable of transporting 50-60 passengers, with turboprop engines, at a cruising speed of 350-400 miles an hour." Four manufacturers have submitted proposals. The details have not been announced, but reports are that essentially this is what they have to offer:

 A Convair 340 modified to take four turboprops, which would probably be more powerful versions of the Dart used on the Viscount

A Douglas DC-6 with a shorter fuse-

lage—the full length is not needed on short-range service. It would be powered by either American or British turboprop engines.

• A brand-new Lockheed airplane, us-

ing four U.S. turboprops.

 A new Vickers Viscount, but with more powerful Rolls-Royce engines not yet in production.

Lockheed, meanwhile, is redesigning a Super Constellation, with a longer fuselage and thinner, longer wings, to take

turboprops. This L1449 would have a
speed of over 450 miles
an hour, a range of
about 5,000 miles.
There is also talk of
modifying the Douglas
DC-7 as a luxury turboprop for the cross-continent and transatlantic
trade.

Always it's the engine that sets the limits of an airplane's performance. More powerful, more efficient piston engines have given us faster and bigger planes over the years.

But the piston engine has about run its course. As perfected today, the best it can deliver is about one horsepower for one pound of weight. A single engine weighing 4,000 pounds is deemed to be the maximum that can be handled with aerodynamic efficiency. If we want more than 4,000 horsepower, the piston engine becomes too heavy, too big, too complicated

The turboprop, however, delivers two horsepower or better for a pound of weight. The jet does considerably better even than that—but at very high speeds (better than 500 miles) and very high altitudes (40,000 feet). But the jet is a glutton for fuel and, for commercial use, would pay off only on long-range flights The turboprop, while slower, nurses its fuel. It can handle short-to-medium-range hauls, while also capable of very



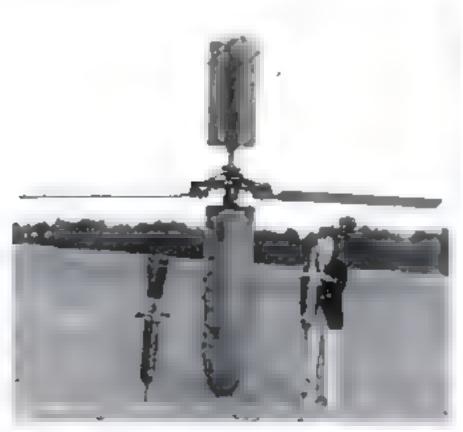
MICKY, mascot at Sault Ste. Marie, Mich., watches wistfully as a Vickers Viscount takes off during the training fight described by the author.

[Continued on page 292]



Tape Recordings Chase Gulls to Make Airfields Safer

This captured sea gull may save a pilot's life. How? His pals, seeing him in trouble, sound a distress signal to scare the flock away. That alarm call, recorded on tape, can then be played to frighten other gulls away from coastal airfields, where birds sometimes smash into windshields and cause plane accidents.



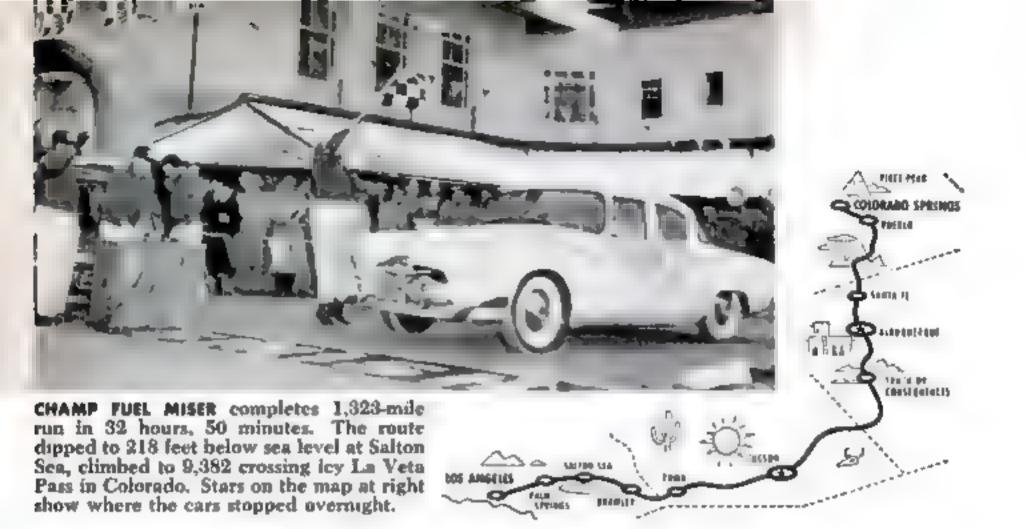
Falling Pinwheels Drop Supplies

A NEW way to drop supplies from airplanes uses helicopterlike blades instead of a parachute. The blades, which unfold and telescope out when the container is released from the plane's bomb rack, are spun by the air stream to float their load gently to earth. Developed by Kaman Aircraft for the Mannes, the Rotochute can be dropped from planes flying fast and low.



Spinning Book Tells the Story

This child's book can talk and sing. Its plastic cover is a phonograph record of songs and sound effects to supplement the story printed on the pages inside. A hole through the middle of the entire book lets it fit on a phonograph. Originated by Bernard and Darlene Geis, Magic Talking Books are published by John C. Winston Co., 23 Foster PL, Hempstead, N. Y



Studebaker Wins Gas-Saving Race

IN MIDTOWN Los Angeles, before dawn one morning recently, Dick Johnson hopped into a new Studebaker Commander and, with 21 other light-footed drivers in 21 other precisely tuned 1955 cars, took off across the desert for Pikes Peak.

When he pulled up three afternoons later in snow-spattered Colorado Springs, Johnson had driven close to 450 miles a day, at a brisk 40 m.p h. average, on less than three tanks of gas. Considering its weight, his Studie V-8 led all the rest in the 12th annual Mobilgas Economy Run.

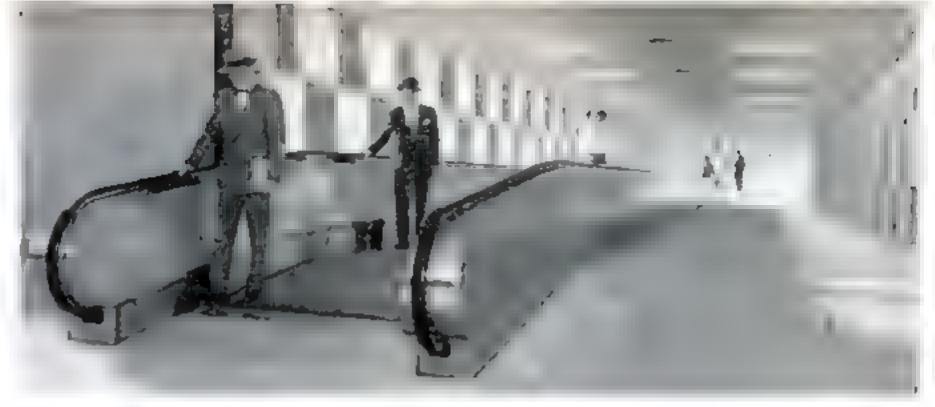
The payoff went not to actual gas mileage, which would have made it a cinch for the small cars, but to ton-miles per gallon. AAA referees figured this by multiplying car weight in tons by miles traveled, then dividing by gallons of gasoline used.

This year, for the first time, all cars in the run had automatic transmissions. The field averaged 2.79 miles a gallon less than the standard-with-overdrive models among last year's entries.

HOW THEY RAN:

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Danny James	22,3283	50.006		
Hart Fullering	20.6544	48 7851		
Mel Al-bury Jr.	18,2294	47.0683		
Verse Holmquist	17.8962	E 43,863		
Al Cottle	19 7827	53 "596		
Harold Michelson	L 18 "S)S	\$1,632		
Act Repr	18.8780	\$0.3666		
Lew Jahro	19.0171	50 109		
	21.5613	50.479		
	CE Pierce Venable Woods Bell Robert L. Dookis Danny James Hart Fullering Mel Al-bury Jr Verse Holmquas Al Coule Harold Michelson Let Rone Lew Jahro	CE Pierce Venable 25 1856 Woods Bell 27 5543 Robert L. Donkin 25 2901 Damy James 22 3287 Hart Fullering 20 6544 Mel Al-bury Jy 16 2294 Verue Holmquist 17 8965 At Courte 19 7827 Harold Michelson 18 7515 Art Rene 18.8780 Lew Jahro 29 5613		

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Rodeo-Bound Texans Get There Faster on Moving Sidewalk

Tius moving sidewalk saves Texaus a 114foot hike at stock shows and rodeos in the Houston Coliseum. Set up on a bridge from the parking lot, the endless rubber belt

moves over steel rollers to carry crowds up a 12 foot rise. It reverses its direction when the show is over. Goodrich and Link-Belt engineers teamed up on the project.



PAINTER SPRAYS ROOFING PAPER with white traffic lacquer. Within seconds, before lacquer is dry, another workman sprays the paper with tiny glass beads that sparkle under light.



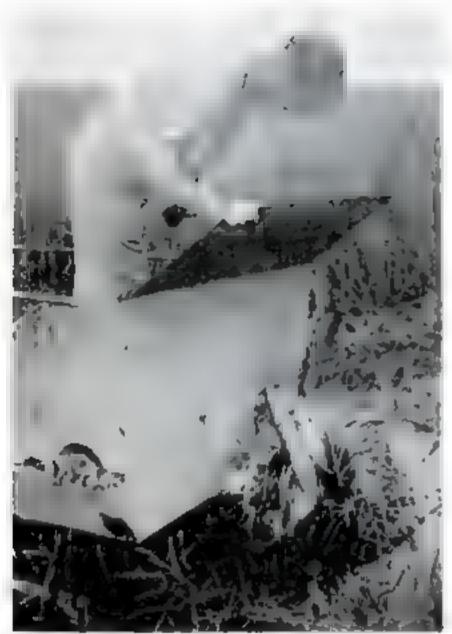
CUT STRIPS laid down in parallel pairs divert traffic to one lane of new road. An ordinary pocketknife is used to cut four-inch strips across the width of the roll of paper.

Paper Strips Guide Cars Around Road Work

To shoo traffic off parts of new roads still under construction or to route cars around sections of old road under repair, highway men in California make their own temporary markers. Cut from black roofing paper painted white and coated with beads that reflect light, the strips cost only a few pennics apiece. The paper can be taken up easily and leaves no marks to confuse motorists when the road work is finished.



ROMER PRESSES STRIPS down into hot paving. On old roads under repair, strips are stuck down with asphaltic emulsion. A shovel pries them loose when they're no longer needed.



Marsh Digger Opens Everglades

Sportsmen may soon be penetrating the mysterious Florida Everglades. A marsh digger (above) is cutting through waisthigh vegetation, leaving "water trails" in its wake. Like a flat, steel-hulled motorboat with rotary blades at the "prow," it digs channels wide and deep enough to be navigated by canoes and small motorboats.

Plastic Body Serves as a Chassis, Too

This plastic three-wheeler has no chassis—it's made in two pieces with the reinforcing structure molded into the underhalf. Just under nine feet long and only 53 inches high, the experimental Stationette seats two and has 110 cubic feet of cargo space. A 24-horsepower rear engine gives it a speed of 45 m.p.h. Bassons Industries, Bronx 60, NYC, molded the body.

Shaker Keeps the Salt Pouring

SALT can't clog in this shaker. The hinged lid is fitted with tiny spikes that fit into the pouring holes to keep them clear of caked salt and to seal them against dampness when the shaker is not in use. Finger pressure pops up the spring-held lid. Invented by a German



who got tired of pounding at clogged salt, the shaker is made by Steinberger & Vorsanger A.G., Am Schlachthof 1, Wiesbaden.

Outside Switch Lights Room

THERE'S no fumbling for the light switch in a dark room with a new German system. The switch box is placed outside the door, just above the lock, so that you can snap on the light before turning the knob. The switch is connected to the house circuit through special hinge. Shown here on the door of a hotel room. the inventor expects



the switch to be used in private homes, too. Dr. Deisting & Co., G.M.B.H., Kierspe, Westphaha, Germany, makes it.



Falcon Can't Miss Its Prey



DEATH TO BOMBERS, new Falcon tails a drone B-17 (right) and pounces for the kill (above).

ENTAL bombers will be sitting ducks for the deadly baleon. Its electronic brain guides it to the target relentlessly following any exister maneuver. Soon to be arming many defense intercept as the guided massile was developed by Hughes Aircraft.

The Air Force also reveiled an interest trouted distributed Atlas, which could strike bussia from the U.S. speeding thousands of notes an hour on a power plant developing nillions of horsepower.

SMALL MISSILE fits under fighter wing, fires itself automatically when target gets in radar range.





Strange Wing Shapes Mark Fast and Effective Jets

Facts and pictures filtering through the Iron Curtain indicate that the Russians are trying strange new airplanes unlike any

seen in the West. What two of the strangest may look like is shown in these sketches. According to the U.S. Air Force Association's



Bottles to Map Ocean Currents

Water for bobbing bottles at the shore this summer. About 12,000 hydrographic bottles are being set adrift off the Mexico-California coast, Return of the post cards in the Duraglas containers will help the Scripps Institution map ocean currents.



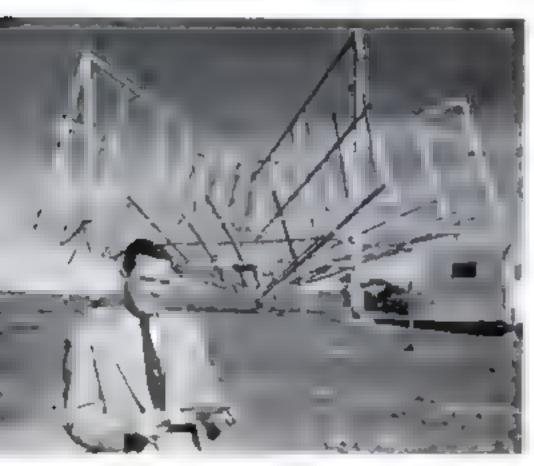
Model Previews Atom Tank

HERE is what an atomic-powered tank might look like. The U.S. Army has built its present conceptions into this wood model, Plans call for a 155-mm cannon as chief weapon if and when a full-size baby rolls out of the Detroit Arsenal.



Reported Among Russian Air Force's New Fighters

unofficial publication, Air Force, the squarewinged jet (left above) is a Yak-21 that can cruise at low speed to save fuel. The double delta, or flying rhomboid (above), is said to be able to stand on its tail after take-off for a 70-degree climb.



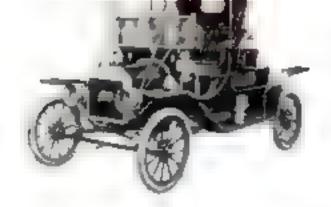
Radar Detects Meteor Dust

Trus odd radar antenna, meknamed the "Spider," sits on a California hilltop and beams signals in six directions at invisible meteor dust. Stanford University scientists are charting the dust stream to study its effect on radio communication.



Army Gets "Machine-Gun" Hypo

FORMIDABLE as it looks, this "gun" hurts less than a hypodermic needle. Instead of piercing a vein, it shoots vaccine right through the skin. With it, Army doctors can give shots to 1.000 men at a time without stopping to refill it.



Try one of these wicked, gone gocarts. They're bound to put youth in your heart and a burn on your bald spot.

How to Buy That New Convertible

HOOSING a convertible is a hateful job. It's like trying to make a choice between Marilyn Monroe and Gina Lollobrigida.

And it's complicated, often, by the necessity of justifying the purchase of any kind of a convertible to a wife who complains that she can't keep a set in her hair with the top down.

Backed into a corner, the average man



Fender-mounted grid, to close top automatically if it rains, is available on some cars



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is likely to resort to an iron defense like, "Humphrey Bogart owns one." Or, "This idea is bigger than either of us."

Well, why does he want a convertible? They're expensive. They're noisy They're drafty. Their trade-in value may be low The top is always up when the weather turns salubrious. The top is always down when it starts to rain.

And practically everybody, at one time or another, dreams of owning one.

Including, probably, you.

The appeal of the convertible is insidious, and the wardrobes that the stylists have given the 1955 crop are no help to the sales resistance of the man standing clammy-handed, rooted to the sales room floor and staring transfixed at the job in fire-engine red with seats to match.

This year the exterior colors are straight from the gaudiest bands of the spectrum. Inside, the decorators take it from there.

Here are the color combinations offered by a single convertible maker:

Shoreline Beige and Gypsy Red
India Ivory and Coral
Glacier Blue and Skyline Blue
India Ivory and Regal Turquoise
Neptune Green and Sea Mist Green
Shoreline Beige and Autumn Bronze
India Ivory and Harvest Gold
If a man wins the initial bout with his

Fold out to see lanciest convertibles

convertible, at 275 horsepower, is one of four super-dreamboats turned out by Detroit. Like the Cadillac, it is priced to include almost all the extras that Lincoln and Chrysler list separately





in red (above) is
the perfect
example of the
convertible's
appeal to boys of
all ages—from
16 to 60

[- 7 (- 5]

glamor—the
moonlight and
honeysuckle touch
by a swimming
pool—is strictly
intentional

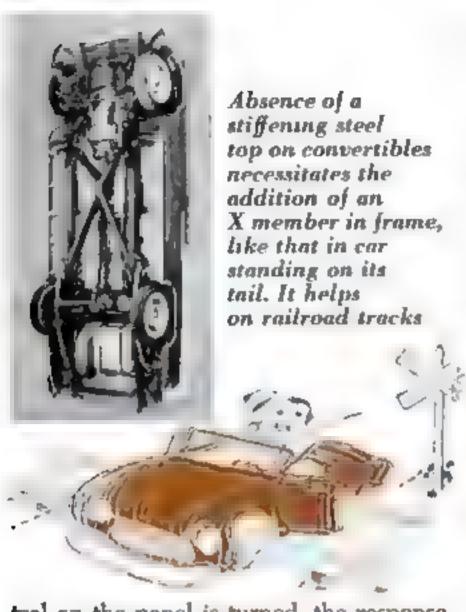
What Those Extras Cost	BINCK Special	CADILLAC Elbarado	CHEVROLET T-3	CHRYSLER ICEW YORKER DE LEDGE	Foth V-8*	LINCOLM	PACKARD CARIBBEAN	OFF AMORAH DEF AMORAH
Base price of car	\$2555.	\$6286.	\$2305.	\$3585.	\$2327.	\$3727.0	\$5892.a	\$ 2326.
Air conditioning			-		435.	_		
Automatic fransmission	192.50	5	178.35	\$	165.	\$	S	178.30
Automatic headlight dimmers		48.20	44.25			E		
Back-up lights	F	\$	5.85	2	7.85	\$	S	8.10
Curb buffers		D			-	24.	D	_
Custom steer og wheel	15.10	D		6	18.95			6.50
Door guards	3.95		6 90		2 95	2 75	D	
Electric clock	H	3	3	S	13 60	\$	\$	17 25
Electric windshield wipers		\$	10.50	5		S	S	5.40
Engine power package		S	59.20		35.		"	31 60
Exhaust pipe deflector	1 95	D	D	C	2 95	S	D	
Fender akiris		3	_	_	17	S	30.50	
Fog lamps		3		D	15.50 _o	34.50	D	
Glove-box light	S	S	S	3	1 75	\$	8	\$
Hand brake flasher	F	\$	4.25	\$	3.95	S	D	
Hautge	#1.70	S	72.80	76 20	66.44	112.50	S	48 50
Meany-duty generator voltage regulator		s		29 75	20 70		s	12 40
License plate frame	н	S	3.25	\$		Š.	D	D-Shared
Luggage-compartment fight	#	5	1 95	S	1.25	S	D	\$
Oil-bath cleaner	S		8.80	8	2	3	\$	S
Dil filter	S	3	11.85	3	8.51	3	5	\$
Dutside rear-view mirror	S	S	6 95	6	3 95	D	Đ	4 05
Outside-mounted spars wheel		0	123.		134.50	0	\$	
Power brakes	38 70	3	37.70	5	33.50,	40.	5	37 70
Power seat	69 90.	S		65.,	60.	65.	S	45 20
Power steering	107.50	S	91.50	105.	85.	120.	S	96.90
Power windows	96.80.	S	ı	95.	95.	100.	S	102 30
Radio	92 50		62.	92 80	92 50	121 60.	\$	89 70
Radio, signal-sealing	122.60	. 3	105.	123 80	_	_		
Rein-triggered top		b	34		35.a			
Tinted glass	32 30	45.55	32 30	30.	21.43	27 50	32 30	30.20
Turn indicators	\$	\$	\$	\$	14.16	S	S	16 20
Ywo-tone body	23 70		28.85	\$	25.		\$	\$
Wheel covers	Н		8	S	13.60	S	\$	14
Whitewail tires	28 60	S	26 90	33.10	28 67	35 20	5	26 65
Windshield washer	F	\$	7 50s	G	8 89	10 50	S	10.50
Wire wheels	317 20	3 N		215.	39 95	_	460 50	53,90
TOTALS	13687 40	\$6379.75	13351 95	\$4380.85	\$3834.55	14425 55	16415 30	13161.65

Unless otherwise noted, price quoted is factory-suggested list, including Federal tax but not including freight sales taxes, licensing of dealer charges. Price covers car without accessories of exitus except where they are standard equipment. With Ford and Chevroiri, accessory prices quoted do not include installation charges. Dark (—) means not mariable A Federal tax not included in accessory prices; B. Torston but suspension is standard equipment on this model, C. Does not include Federal tax; D. Installad by dealer; E. Academic presently, F. Sold as part of four-tiem accessory group (includes glateproof mirror) conting \$32.30. G. Sold as part of four-tiem accessory group costing \$37.50.1. Price, \$148.30, includes power seat and power windows, J. Turvines seat \$42, h. Four-way power window price includes 2-way power seat. L. Buth tent-seat speaker, normal antenna, M. Bundshield and y. N. Saber-spake wheels, S. Standard equipment

wife, he can dally for weeks among the wares of the convertible manufacturers. There are all kinds of things he—or you—can investigate.

How are the weather seals between the top and the windows? Between the top and the windshield? Convertibles are better all-weather cars than they used to be. They offer more protection against rain, snow and low temperatures. If a convertible can't splash through a hard rainstorm without getting dribbles of water on the inside, it's behind the times.

How positive is the mechanism that raises and lowers the top? At one time this was all-electric. Now the best of them wed an electric motor to a hydraulic accumulator that adds muscle to the chromed seissor levers. When the con-



trol on the panel is turned, the response should be instantaneous and, above all, smooth.

The top material should be vinyl, or even Orlon, generously backed with a close-woven cotton fabric. The time was when tops, of cotton, would begin rotting and fraying within a year despite loving care.

The traditional mark of the convertible used to be its shudder in crossing railroad tracks. Its convolutions were those of an Airedale shedding water. But things have changed. Get down on your hands and knees and take a look at the heftiness of the X member that braces the frame. Better yet, drive the car over a bumpy crossing.

Most of the new bodies are stronger in other ways, too. But see for yourself. Does the seductive wire-wheel job in orange-yellow have stiffening members across the firewall, immediately behind the engine?

Passenger capacity? That rear seat, squeezed between the front seat and the well for the top, used to be sized for only the small fry. Now the leg room ought to be enough for adults. But don't accept the salesman's bland statement that the convertible is a six-passenger

vehicle. It will hold no more than five nicely unless it's one of those monsters with a price tag like a yacht.

That rear plastic window ought to bear a fair resemblance in size to the rear window of a sedan. If it's small, beware. The wrap-around fabric in a convertible makes it blinder than cars with hard tops, and today's traffic requires visibility. Don't forget to order an outside mirror. Ripples in the plastic window distort the view in the inside mirror.

Power is no mere added luxury in a convertible. What's the horsepower? The torque? Convertibles are heavy. They scale from 100 to 200 pounds more than a comparable sedan. That's mostly due to the beefing-up in the body. A few dollars more, in many cases, will buy a power package to insure performance.

Finally, while convertibles are relatively expensive, the price need not be sky-high. The car exhibited in the sales-room may be tagged at \$3,000 or more, freight and handling excluded. But what extra equipment has been loaded on it?

Its base price, without the fulls and furbelows of an automatic transmission, power steering, power brakes, rain-sensitive machinery to lower the top automatically and leopard-skin upholstery, probably is around \$2,200. That's only \$250 more than the base price on a sedan.

The buyer, love-struck on a convertible, seldom gets away that cheaply, though. When he walks into a salesroom, the man is likely to say, "Well, I've got a dreamboat here, with a soft hat, white shoes, music and all the jewelry."

Take one look, brother, and you're lost.

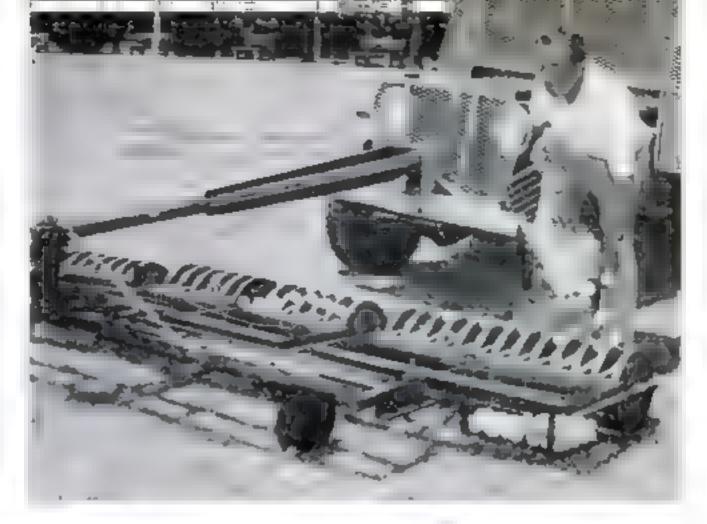
-Devon Francis.



"Armored" Jeep Rakes in Balls On Golf Range

THE golf-ball retriever riding the front of this jeep clears a Miami driving range in a hurry. Caught between wheels, the balls are lifted and popped into the flat baskets attached to the front of the apparatus

Netting enclosing the jeep protects the driver against flying balls as he rides the range.



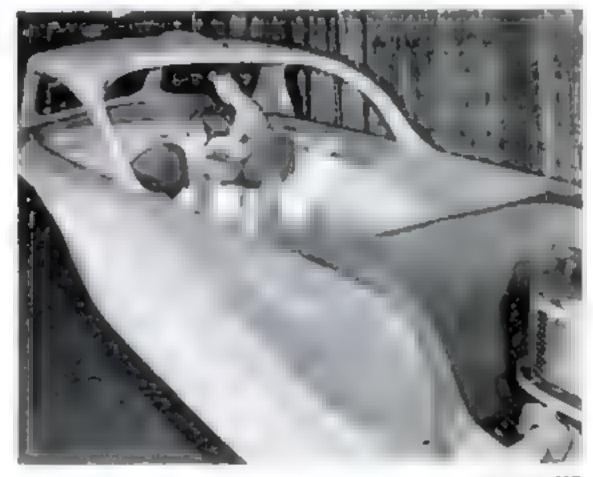


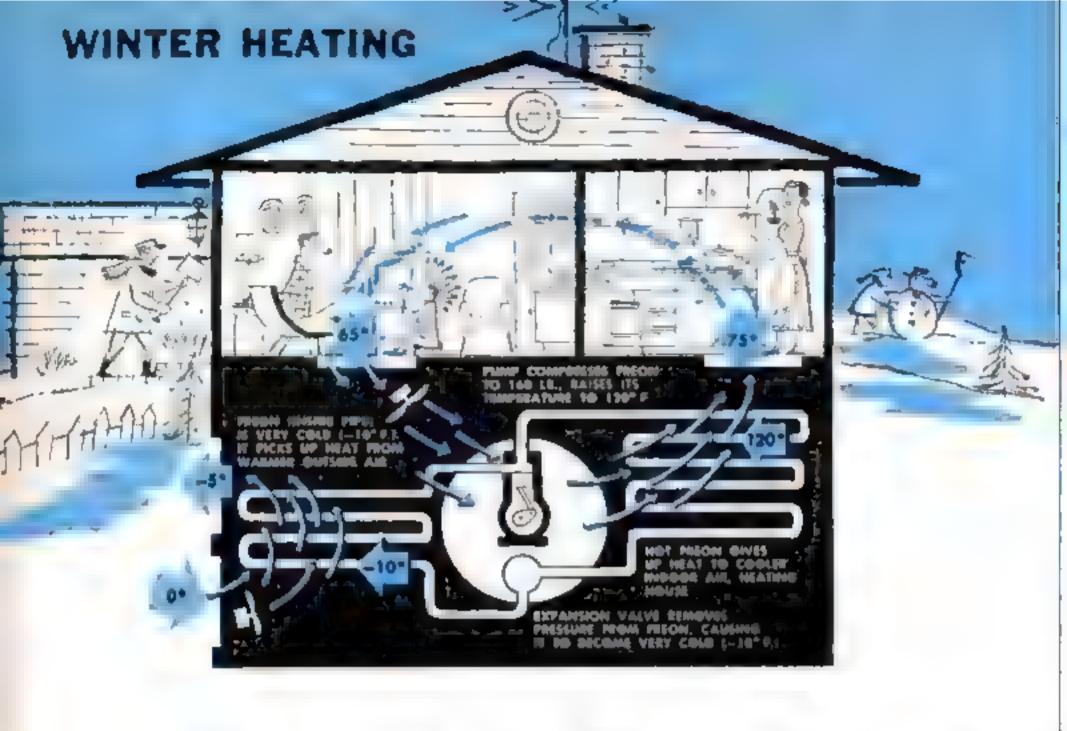
Uranium "Gun" Hunts for Radioactive Rock

THE hunter at left is aiming at uranium—he hopes, luside his "gun" there's a high-intensity counter tube and an amplifier. The instrument weighs less than two pounds and gets its power from a flashlight battery. Curtiss-Wright Corp., Wood-Hidge, N.J., designed the Radiatector for contamination surveys and lab analyses as well as for prospecting.

Plastic Cruiser Has Plastic Chairs, Too

HERE'S a sea-going "hardtop," It is all plastic-even the chairs are molded as part of the hull. The outboard cruser has 18 flotation chambers to add buoyancy and rigidity. The deep rear cockpit keeps out backwash and the outboard-motor well is self-bailing. Car polish keeps the plastic shining and barnacles get no footholdthey can be brushed off the surface. U.S. Fiber Glass Products, Inc., Costa Mesa, Calif., makes the boat.





Now You Can Pump

Home unit takes warmth from the air and puts it inside in the winter, outside in summer.

By Herbert O. Johansen

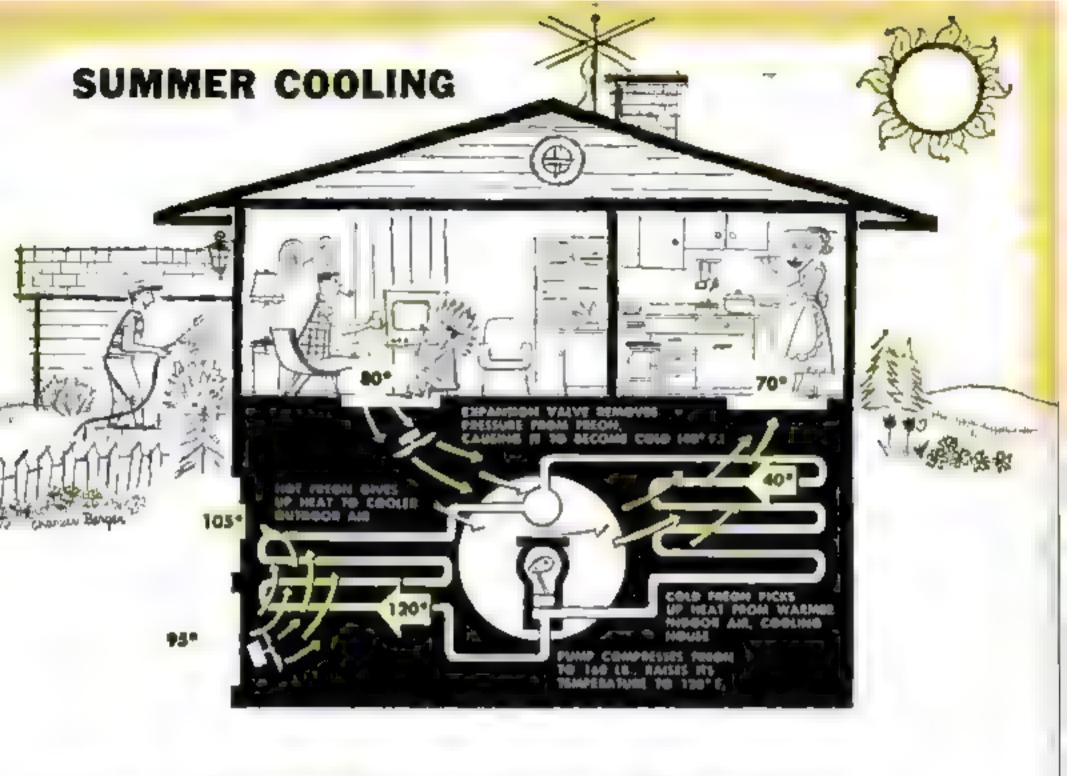
THE bugs have been engineered out of home heat pumps. Within 10 years, heat-pump manufacturers predict, more than a million U. S. homes will have automatic, year-round electric airconditioning systems that use air as "fuel."

General Electric and Westinghouse are putting out packaged units now. They cost only a little more than good conventional heating and cooling systems. In most parts of the country, the electricity required to operate one of these systems is comparable to the cost of fuel oil, gas or coal. Manufacturers

are working on low-cost heat pumps. And if atomic energy reduces the cost of generating electricity, you may find heat pumps in low-priced homes as well as expensive ones.

Then, predicts William G. Cox, GE air-conditioning expert, heat pumps will supply hot water and running ice water, handle all food refrigeration, take care of low-temperature cooking (up to 212), and store heat for use when needed.

Houses without chimneys will be commonplace, since a heat pump requires no furnace outlet. All windows can be permanently sealed, since the machines circulate plenty of fresh air. Dusting will be practically eliminated. A heat pump creates no dirt of its own, and with a glass-fiber filter in the indoor air intake, it serves as a central vacuum cleaner. You'll feel no humidity, even on the miggiest days.



the Heat In or Out

How do heat pumps work? Charlie Berger, the artist who made the drawings above, had never heard of a heat pump until I started explaining.

"You mean," he asked, "that even if it is zero outside you get heat out of that freezing-cold air and pump it inside to warm your house?"

"That's what an air-source heat pump does," I said.

He looked at some rough sketches. "And according to these, in the summer the thing reverses itself and cools your house by picking up heat from the inside air and pumping it outside, even on the hottest day?"

"Right again," I said. "The heat pump picks up heat from the air and puts it where you want it, outside in the summer for cooling, inside in the winter for heating."

He didn't look convinced.

"Of course," I said, "some heat pumps—more complicated to install—get their heat out of the ground and others out of water."

"And I suppose," he said, "that they take heat from the house and put it into the ground or water for summer cooling." When I nodded, he almost walked out

"Wait a minute. Charlie." I said. "It's really very simple. You have a heat pump in your house now."

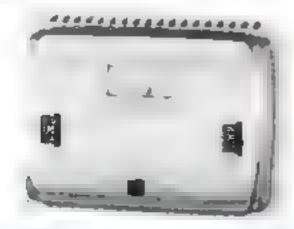
"I have?" he asked

"Your electric refrigerator is a heat pump. It keeps food cool by taking heat out of it. That heat is transferred to an outside coil at the back. When the refrigerator is working, you'll find that the coil is quite warm."

He nodded agreement.

"Now," I went on. "let's suppose you put your refrigerator in a wall with its

These are the parts you will find in a heat-pump home



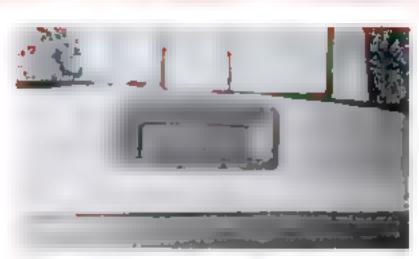
WALL THERMOSTAT has dual controls—heat and cool. If house becomes warmer than a preset temperature on the cool control, machine automatically goes to cooling.



LOCATION of the heat-pump unit is not important so long as it has easy access to out-door air. Here is a basement installation of the new GE Weathertron.



OUTSIDE AIR enters left louvered opening, is blown out through the other. Passing over Freon-filled coils, air gives up warmth for henting, removes it for cooling.



ROOM REGISTERS blow warm in winter, cool in summer. So gentle is the air flow that, when this photo was taken with the pump in operation, curtain hardly stirred.

door open outside and its coil facing inside. Instead of taking heat out of food, it will take heat out of the outside air and transfer it to the coil inside the house. It has taken heat from outdoor air and put it indoors."

"I get it," said Charlie, "If I then turned the refrigerator around with the door inside, it would take heat from my house and put it in the coil outdoors."

"That, in principle," I said, "is an airsource heat pump."

As you can see in Charlie Berger's drawings, a heat pump's machinery has an indoor coil, an outdoor coil, with fans for each, and a compressor. For heating, this is what happens on a zero day:

Freon 22 refrigerant (used in the newly announced GE Weathertron heat pump) is pumped into the outdoor coil where it is cooled down to minus 10°—10 degrees colder than the outdoor zero air. Since heat tends to flow from a high-

er temperature to a lower temperature, the Freon picks up some outdoor heat in this case, five degrees—as it is blown over the coil.

The Freon is then compressed, in the process reaching a temperature of about 120°. This warm Freon is pumped through the indoor coil. Cooler air, sucked from the house, passes over this coil, is warmed, and blown back into the house. The Freon continues its circuit, getting cold again when the pressure is removed in an expansion valve, and is ready to pick up more heat as it goes through the outdoor coil again.

For summer cooling, the cycle is reversed. (Although Charlie Berger's schematic drawings show the compressor and expansion valve on physically different locations for heating and cooling, the summer reversal is accomplished automatically by transfer valves.)

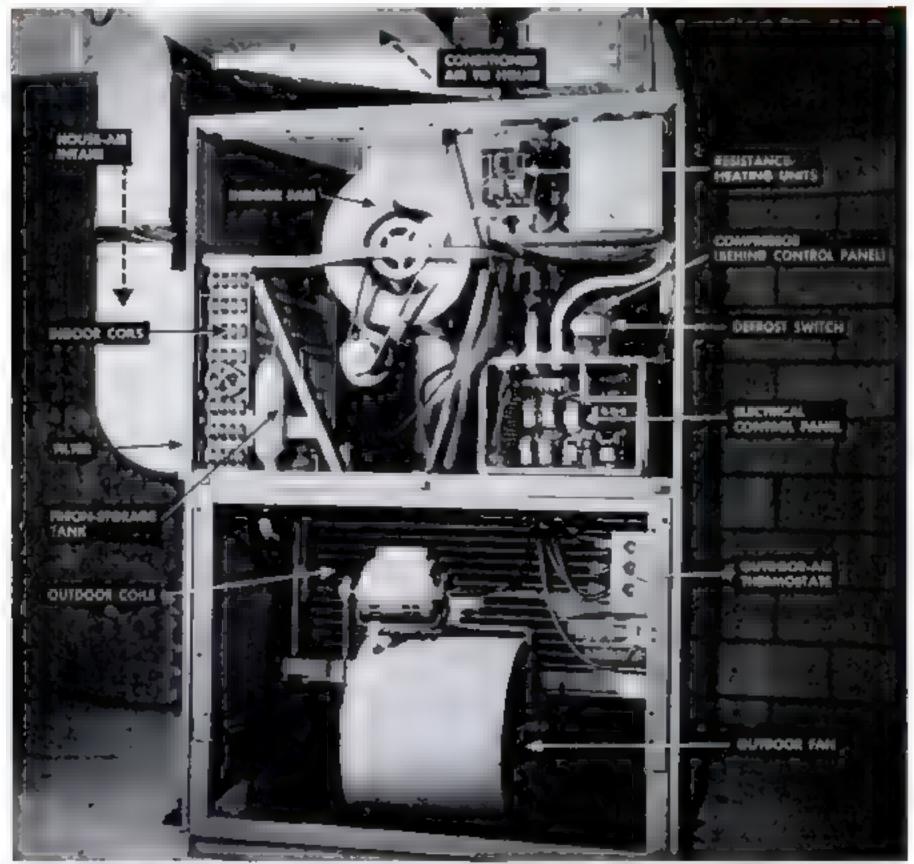
Cooled Freon passing through the in-

door coil picks up heat from the warm house air that is drawn over it. This cool air is blown back into the house. The Freon in the coil, now warmer, goes to the compressor, where, under pressure, its temperature is raised. When it is pumped to the outdoor coil, it is warmer than the outside air, getting rid of the heat it picked up in the house.

Air-source heat pumps on the market today have ample cooling capacities, but the colder it gets outdoors, the more difficult it is for them to extract heat from the air. Below certain temperatures, the machine needs help. This is furnished automatically by supplementary electric resistance heating units.

For good reason, the resistance units are used only for short on-and-off periods during really cold weather: With resistance heat, electricity is burned directly to give heat, delivering one unit of heat for one unit of electricity. The heat pump does not burn electricity directly but uses it to operate a machine that extracts heat from the air. It gives out about three units of heat for one of electricity.

Inside the heat pump—a machine that makes weather



WEATHERTRON HEAT PUMP is designed for a small (six-room) house. Cost of installing com-

plete system will run from \$2,600 to \$3,500. A larger size for bigger homes is available.



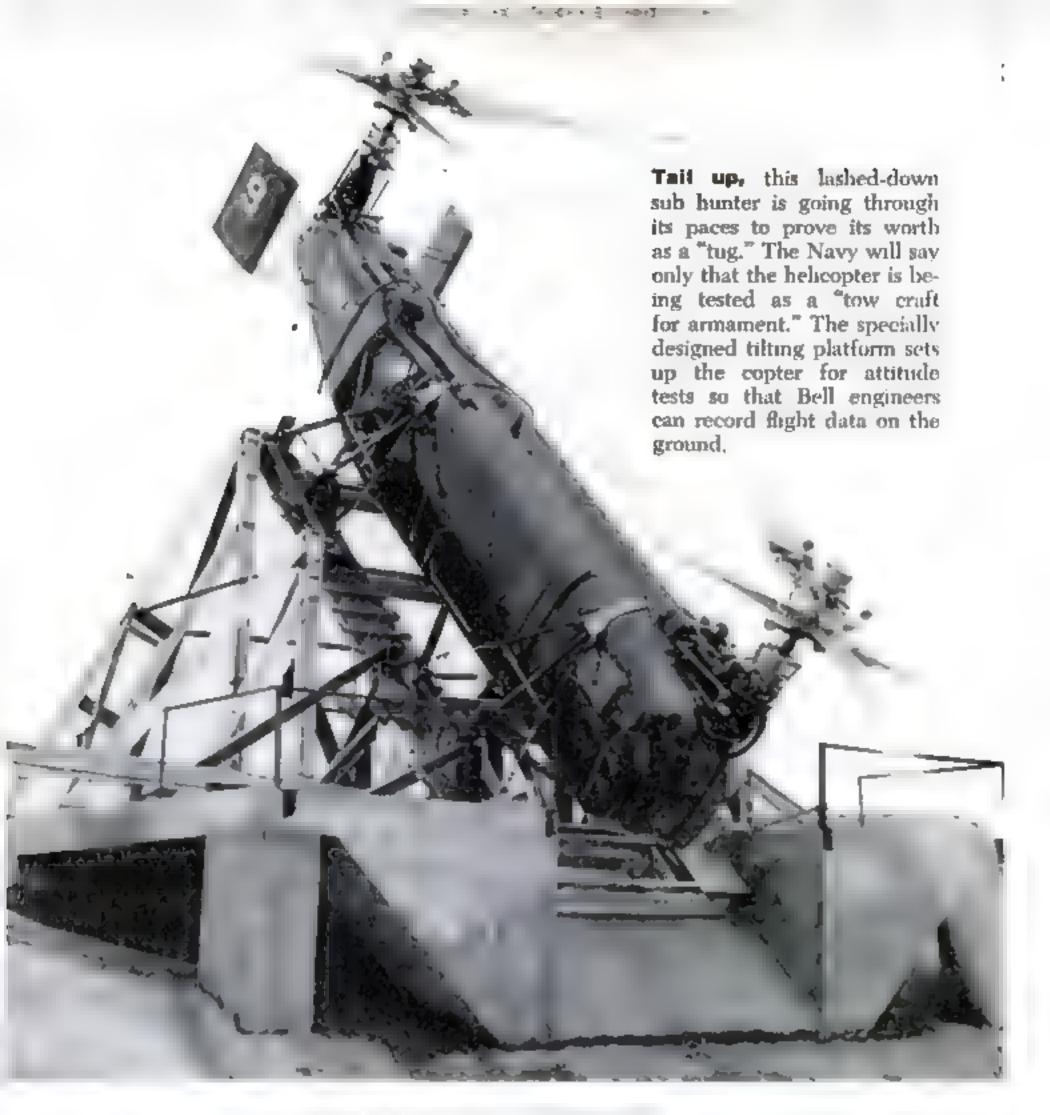
A rescue scoop that dips up ditched airmen like fish in a net is being tried out by the British. A tubular frame keeps the scoop open as the copter trails it through the water. Cords fixed to the hauling line close the net over its catch. Injured men can be rescued with greater safety than by the older sling method.

spin in and land without a pilot? Kaman Aircraft has designed a remote-control job for the Navy. Test flights so far have been within eye range of the ground operator and there's been a pilot aboard the "drone" copter to take over the controls in case of emergency.

Helicopters Show Off New Tricks

There's no splash when this copter lands on its rooftop heliport, but it sits down on water just the same. The rigid platform floats on a liquid cushion that distributes the weight of the copter evenly over the roof by hydrostatic pressure. The water also acts as a fireproof shield and a noise barrier for the building. Interlocking panels that form the float weigh only five pounds a square foot, but each square foot can support 6,000 times its own weight. The Thomson Research Co., Mesa, Ariz., makes the Heli-Float.







Look, no wheels. Maybe that's why this Army XH-39 has copped two copter records. With its landing gear tucked up and its 400-hp, gas-turbine engine going full blast, it has churned through clouds at 156 miles an hour and bored a hole through the sky 24,-500 feet up. The 2,200-pound Sikorsky's large cabin with 81-cubic-foot capacity can carry three passengers and 100 pounds of baggage, two litter patients and a medic, or 800 pounds of cargo.

That Wonderful Machine on Your Wrist By GLOTE KONT

Swiss watch is a 1/100,000-hp. engine—put together by hand with tools that can split a hair.

on your wristlit runs on 1/100,000 of a horsepower, yet think of the work it performs. Its balance wheel makes five forward jerks and five stops every second—864 000 moves a day at a meed of about 60 miles per hour. And the punishment it can absorb! A friend of mine once left a watch in a shirt pocket, and it wound up in a washing machine. Whirled and beaten and battered for an hour in hot, soapy water, it came out to tell the time accurately.

The people of one small nation know better than any other how to make these remarkable instruments: Switzerland to-day produces 60 percent of the world's timepieces, and, in doing so, achieves a minor economic miracle. (A pound of Swedish steel unloaded in Geneva costs \$5. By the time Swiss watchmakers have finished turning it into hairsprings, the same pound of steel is worth \$5,000.)

The watch industry got its true start as a Swiss industry some 300 years ago when an Englishman—so the story goes—took a ride through the Jura Mountains. There, in the Swiss village of LaSagne, his watch stopped, Rather than carry the useless thing around with him, he asked a blacksmith named Daniel Jeanrichard to repair it.

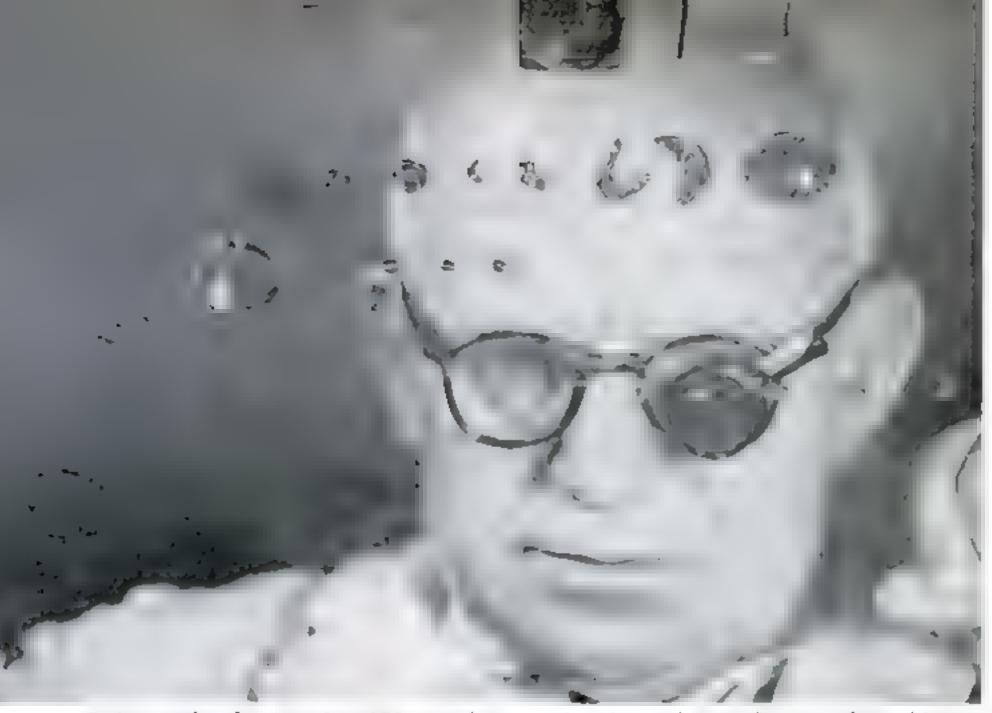
A big man in a leather apron, Jeanrichard confessed that he had never
seen a watch before, but he would try to
fix it. Like all of the Jura people, he
was handy: not only did he fix the watch,
but later he made another for himself,
from memory.

farmers, shepherds, locksmiths, carpenters—saw Jeanrichard's watch and learned how to make a watch themselves. Then men in other villages followed suit, until the craft spread up and down the mountains. This was a pleasant, absorbing trade, exactly what these people needed to while away the tedium of six-month-long winters. It was their patience and skill, combined with the bril-

IN HOROLOGICAL SCHOOL a grant model is used to explain movement of jeweled-lever watch.

STUDENT regulates hairspring so balance wheel will oscillate exactly 15,000 times an hour.





Swiss watchmaker examines 120 parts for a man's wristwatch spread out on glass table top.

liant improvements and inventions of the Geneva artisans that concentrated watch-making in Switzerland.

Today Switzerland exports approximately 33,000,000 watches and movements per year. Most of them are turned out in the 2,500-odd shops and factories which employ some 70,000 men and women. A small number, however, are still made in the old-fashioned way in farmhouse living rooms by men who manufacture everything they use, from balance wheel to second hand

There is no assembly line, as we know it, in a Swiss watch factory. There is very little noise. Here and there are mountain-sized machines that labor to bring forth mouse-small parts, achieving tolerances of 1/20 the thickness of tissue paper. One jig borer can split a hair into 50 equal parts.

For all this mechanization, 60 percent of watchmaking is hand labor. Out of the 1,400 operations that go into making a timepiece, 1,000 are done by craftsmen who work under conditions that would give a normally nervous man the jumping jeebies.

Talking is taboo, not only because it distracts but because vapor issuing from the mouth can have a corrosive effect on a watch's parts. A sneeze is a near-crisis, and a yawn at the wrong moment may seriously impair accuracy.

Perspiration is also dreaded, and the chronic sweater either quits watchmaking or keeps drying his hands. Smoking is forbidden. Women may not wear perfume. Every worker, when he enters, sheds shoes and dons slippers and smocks, to protect the movements from the dust of street clothes.

For the dainty and painfully precise job of attaching the hairspring, women are universally employed; men are, as a rule, too heavy-handed. A crook of so much as a millimeter in this delicate gadget, the merest overstretching, and your watch is off by minutes. Men are experts in other departments, however, including the handling of pepper-speck-size screws—so small that 50,000 of them will fit into a thimble!

That craftsmen in so precise a profession as this should be well rewarded seems only right. In an earlier day the Swiss watchmaker earned twice as much



Thinnest watch fits between teeth of a comb.

as any other journeyman, and in that day he was the only journeyman permitted to carry a sword. Today he earns 20 percent more than any other Swiss artisan, and is among the highest paid in Europe.

Thy are the Swiss so skilled in making watches? The inheritance of patience and a passion for exactitude are factors in the development of such skill, but most Swiss believe that chief credit should go to the schools.

There are seven horological schools in Switzerland which are, in fact, topnotch schools of all-round technology. The shortest course is 15 months—for certain régleuses, the girls who attach the hair-springs. The longest is seven years—for a master watchmaker. Employers are lined up waiting for them as they graduate. There is little unemployment in this industry and there has been no serious strike for 16 years.

The applicant for admission to a watchmaking school submits himself to a set of aptitude tests. In the first, he is given a plate covered with small holes which range in diameter from a hair-

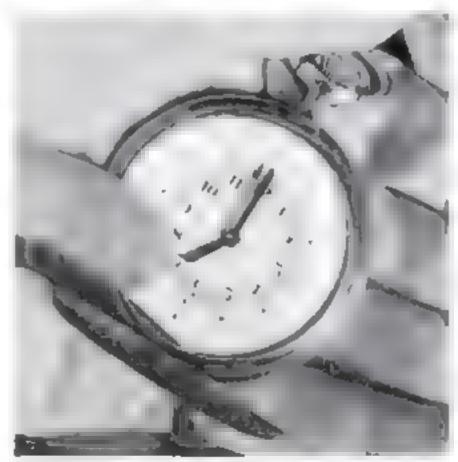
breadth to 1/16 of an inch. With this, he is handed a pair of tweezers and a box of screws. He is required to pick from the box the screws that will fit, and then screw them into position. His errors are noted, and as he works, he is timed.

In a second test—also aimed at assessing an applicant's judgment of size, depth and distance—he is shown a pair of calipers several feet away. Task: to set the pair he holds in his hands to correspond with the remote pair.

In another he is given a length of wire and a pair of pliers, with instructions to bend the wire to match a geometrical figure drawn on a sheet of paper.

There are at least a dozen such tests, and they differ little from school to school. At the end of the first semester they are repeated. If a student has not improved in his ability to do them, and if there are no extenuating circumstances, he is dropped.

Once admitted to a school, the student's first task is to cut a block of wood down to millimeter-precise dimensions. Then he is given a watchmaker's diminutive lathe, which will be his to clean and care for as long as he remains in school. In time he makes his own tools, A watchmaker has more dies, gauges, stamps, awls, screwdrivers and punches than a surgeon has knives. No craftsman worth



Braille watch, for the blind, has raised points.

his salt has any less than \$250 worth.

During his course, each student makes every part of four chronometers. A chronometer has 300 parts, as compared with the 150 of an ordinary watch.

In their classroom work students are taught geometry and trigonometry, languages, drawing, astronomy and metallurgy. They are lectured on the theory and history of timekeeping and, with the aid of films and a huge model watch with a winding knob as big as a cabbage, learn what goes on behind every tick.

Out of Switzerland have come most of the modern advances in watchmaking. The Swiss were the first to put jewels (as bearings) in watches, the first to make a foolproof escapement, the first to combine nickel and steel in the modern hairspring, the first to make watches that were waterproof and self-winding.

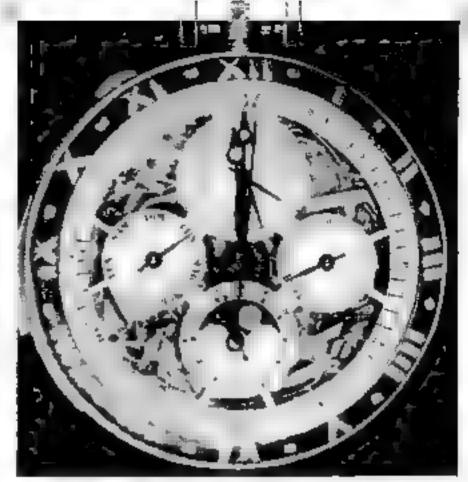
It takes only a few seconds to wind a watch, yet for 200 years men have been trying to produce a satisfactory self-winder. One man decided that the best scheme would be to use the wind. So he worked out a drive shaft that connected his timepiece with a weather vane on the roof. It worked, but you couldn't take it with you.

Change in air pressure, caused by opening and shutting doors, was another fellow's idea—and it also worked. The trouble was that on a quiet evening at home, with no one coming in and out, the watch would run down.

Another inventor tried using temperature changes. He put a thermometer inside his watch, and when the mercury rose by as little as two degrees it forced up a bar that kept the instrument going.

One of the best self-winders—and a promise for the future—is a clock now in operation in Neuchatel. A photoelectric cell converts light into electricity and provides propulsion through a quartz crystal.

For popular use over recent decades. however, the Swiss have been leaning on a device invented by Abraham-Louis



Complex chronometer tells time, day, date.

Perrelet about 200 years ago—a weight inside the watch which swings on a pivot whenever its owner moves. In effect an internal pendulum, this is the principle of most present-day automatic watches.

An ordinary watch with a single movement is remarkably complex to produce. When you add wheels within wheels, pack movement upon movement, so that a watch will perform certain extracurricular jobs, the production process becomes almost incredible. Here the extraordinary skill of the Swiss comes into play. Into a single case they have packed as many as nine movements, each one designed to perform a specific recording job, and all have worked together in perfect harmony.

The Swiss have made watches for recording distances, for taking the pulse, for counting breaths. They have made slide-rule watches, production counters and telephone timers that let you know when your three or five nunutes are up. They have worked out special watches for parachute drops, for underwater swimmers, for mountain climbers and tide-tellers. They have produced watches with concentric dials that give you solar time, lunar time and the time anywhere in the world. For the last Olympic Games they developed a camera watch that not only recorded photo-

[Continued on page 272]

Jackknife Car Gives Cushioned Ride RYDRAULC ACC STORING VESSER AS SHOCK-ALSO

Rough roads are made smooth by hydropneumatic suspension available in a current Citroen.

REAR wheels trail on pivoted arms behind the chassis to smooth the ride of a new French car—a special extra-price model of the five-passenger Citroen "15" introducing hydropneumatic suspension.

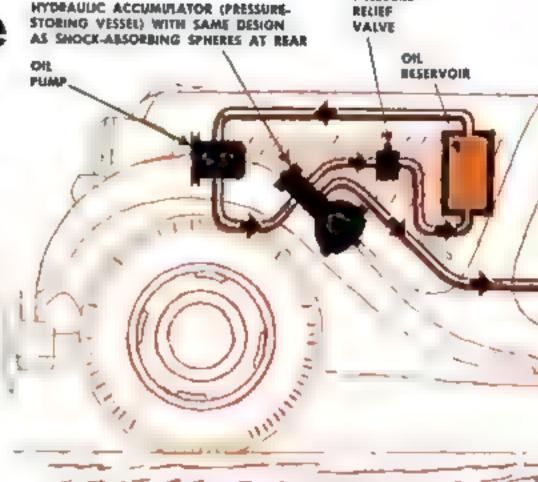
Through downward extensions of the wheel arms, the car's weight is supported at the rear by a pair of pistons, in cylinders containing oil under pressure.

When a rear wheel rides over a bump, its arm rocks and actuates its piston. Through a small orifice, oil flows between the cylinder and a metal sphere, in which inert gas cushions the shock.

Joined by a flexible torsion bar, the arms swing independently. Front-wheel drive enables rear wheels to idle.

Under the hood, an engine-driven pump feeds oil from a reservoir to a hydraulic accumulator (a pressure-storing vessel) and thence at automatically regulated pressure to the pair of cylinders.

If wheel arms swing a little farther than in normal action, rubber cones on their extensions bear against bumper plates on the chassis. This limits settling

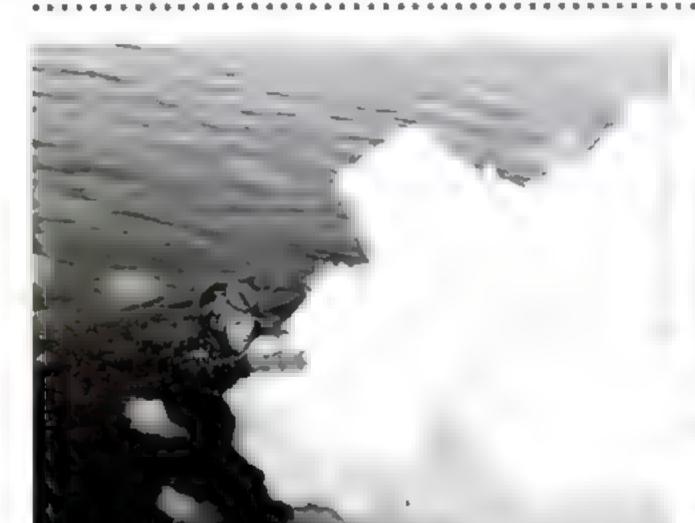


PRESSURE-

TO SUPPORT REAR WHEELS on trailing arms, new hydropneumatic suspension applies oil pressure from engine-driven pump as shown.

or rise of the rear of the car from deficient or excess oil pressure. With engine stopped the car settles to the cone-andbumper stops, observers say, despite a dashboard valve intended to seal pressure; but running the engine again for a few seconds restores pressure and readies the car for the road.

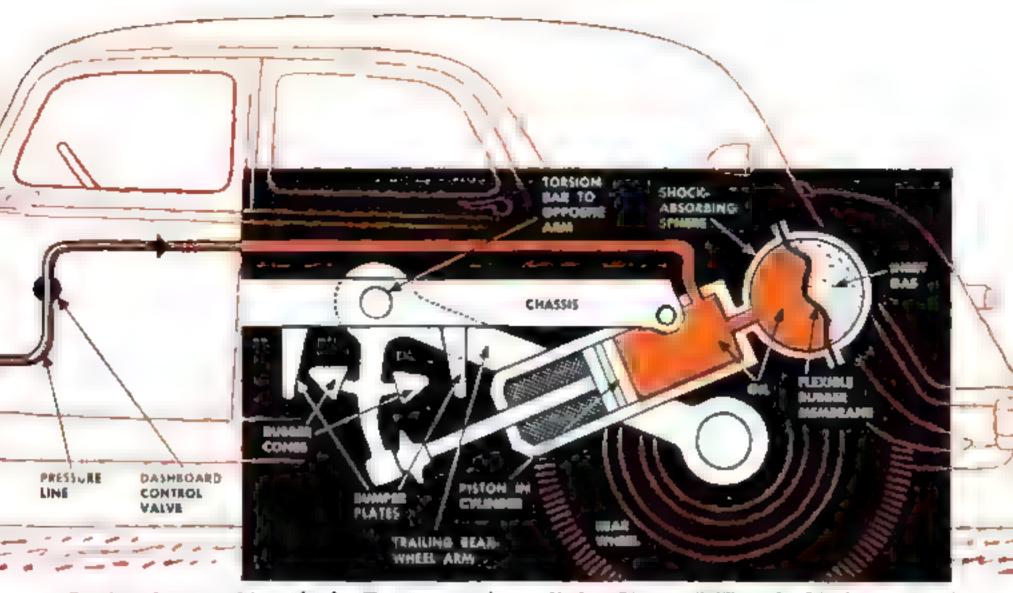
In response to a control valve in the trunk, the car frame jackknifes, then lifts a rear wheel from the ground—a handy aid in changing a back tire.



This Swimmer's a Frogman on Ice

"Come on in, the water's freezing," this Navy underwater demolition man may be calling to teammates from the USS Burton Island. Their chilly job was to test the effectiveness of explosives and special gear (here, an underwater camera) during an Arctic spring cruise

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Gas in spheres cushions shocks. Even on rough road, ride is said to be so smooth that you can read, write or fill a glass of water. Special six-

cylinder Citroen "15" with this innovation is priced at about \$2,685 (940,000 francs), approximately \$200 more than regular model.



to "high" and hydraulic pressure depresses rear-wheel arms, raising body. An A-frame is placed to support the lifted body. With valve

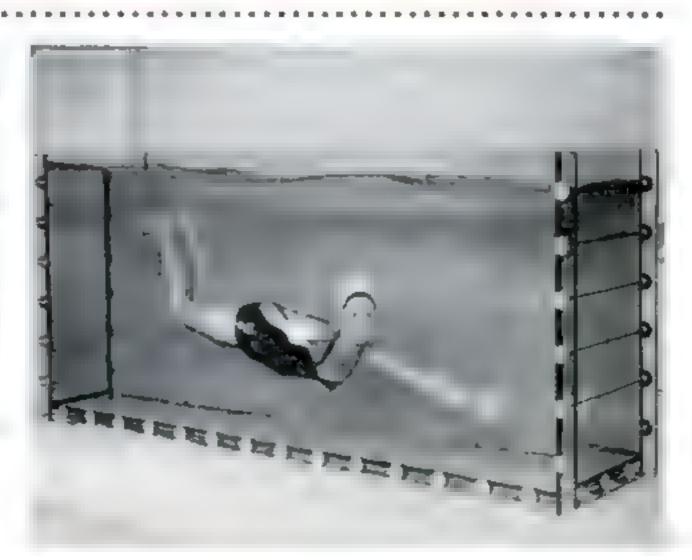


reversed, wheel arms return to near-horizontal position, raising the wheel from the ground on supported side. The same sequence lowers the wheel to the ground after tire change.

. . . This One's a Stand-In for Fish

Making like a fish, a mermaid shows off a nine-foot-long, 540-gallon tank for the Detroit Municipal Aquarium—"one of the largest free-standing all-glass tanks ever built," its maker, the Pittsburgh Plate Glass Co., says. Brass rods connect the sides and bottom of tank.

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Putting a Searchlight on the Deep



STRANGE AND MENACING FORMS move through the mky black depths of the ocean. If man could reach these enormous depths, he disce only points of light white on the drawing flashing around him. But a powerful searchlight would reveal these weird fish swimming by

Weird Fish Live on Ocean Bottom

LIKE creatures from another world, the fish that live in the great depths of the open sea resemble nothing you ever hooked in a country stream. Actually their home is another world, a strange place of tremendous pressures and eternal darkness. No man has ever been there.

Some of this grotesque deep-sea life, however, has been brought to the surface by nets and long lines, and scientists have deduced much about conditions miles down. The drawings on the preceding two pages, prepared by Neave Parker, a British artist, show many inhabitants of the ocean bottom.

Because of the blackness, most "abyssal" fish carry their own lights with them, usually in special lummous organs called photophores, Some, like Mclanocetos johnsoni and Linophryne arborifer, have their lights on upright arms, like radio antennas with illuminated tips. (These names are the Latin scientific ones, since few deep-sea fish are caught often enough to acquire common names.) Chiasmodon niger and Cetomimus storeri have brilliant spots strong along their bodies, like lighted portholes on a ship. Spinex lucifer, a kind of shark, has tiny light organs grouped all over its body to create a uniform greenish glow.

Other types of deep-sea fish have no special light organs, but still glow, either because they carry luminous bacteria on their skins or because they secrete a luminous slime.

A few varieties carry no light at all. These usually have very tiny eyes or, like Ipnops murrayi, no eyes. The unlighted fish are often colorless or the color of coastal fish, while the lighted fish are generally black.

Bizarre teeth and jaws, special feelers and expanding stomachs also mark many of the strange fish. One of these creatures is *Chiasmodon niger*, which can swallow other fish bigger than itself.



Modern Lamplighter in a Dam

KARL WEDEWARD, above, has a full-time job keeping the lamps burning at Grand Coulee Dam. There are 13,000 lamp sockets in 8% miles of tunnelways and three huge buildings. Traveling four or five miles on hour on a motorized cart, he changes about 250 builts a day.



Plastic Hothouse Folds Up

This collapsible greenhouse, shown at a German agricultural exhibit, goes up in minutes. A metal framework covered with plastic sheeting, it weighs only 80 pounds but provides 190 square feet of planting space. The hothouse is also made in larger and smaller sizes by Apparatebau Ziegler, Konigsweg 40-41, Berlin-Zehlendorf, Germany.

CAR-ON-RAILS stops to get regular clearance form from towerman at Selkirk, N. Y., before proceeding east on main-line tracks.

Let's Go Driving On the Railroad



It looks crazy, but it's fun—and real handy if you're president of the N. Y. Central—to have an auto that rides on the tracks.

By Devon Francis

AT LEAST once each week since last fall, someone has telephoned the New York Central Railroad and said, "A crazy guy is driving a car along your right-of-way."

That's not the half of it. The guy not only is driving an automobile on the right-of-way, he's driving on the rails themselves, and at 60 miles an hour.

Every so often he wheels the car off

the rails and goes highballing off crosscountry on the highways as fast as the law will allow.

He's not crazy, though, He knows what he's doing.

He's driving a specially equipped seven-passenger sedan known unromantically as "100." It's the personal inspection automobile of Alfred E. Perlman, new president of the road. It rides the rails on four rubber tires plus four flanged, steel-shod wheels. The flanged wheels

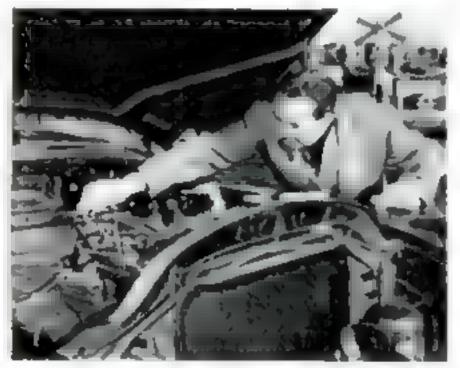
Watching a fast freight bear down on you on an adjoining track can be unnerving at first.



First, it's backed onto rails at crossing.



It's aligned, so flanged wheels can drop.



Turning pressure valve lowers wheels . . .



. . . until they engage rails, fore and aft.

54 POPULAR SCIENCE

Car can be put on rails in two minutes, or taken off in one

go up, at the turn of a valve, for conversion to road travel.

It may be crazy, but it's a handy vehicle. It can be driven from the highway onto the rails, and from rails to highway, any place that there is a grade crossing. The tops of the rails must be flush with the road to effect the change-over.

The car makes inspection trips fast, simple and—mark you this—sheer fun. A man can see everything at a glance through the windshield and side windows.

So far as scheduling is concerned, the Central's "100"—a modified 1954 Chrysler Windsor—operates strictly as a railroad train. It shuttles back and forth on the double- and four-tracked main line working on standard yellow "flimsies," or train orders.

"Number 38 is behind you," the towerman will say as he hands the driver his orders. "You've got 22 minutes' clearance to Peekskill."

Approaching a signal gantry, an assistant calls out, "Red!"

"Red on the board," responds the driver.

He takes his foot off the accelerator and lets the car coast until the tower gives him a green. Now and then he has to touch the brake to keep from overrunning the signal before it turns. In automatic-signal territory, the car has to come to a full stop in front of a signal—



Wheels lock in place with a steel shoe . . .



RAIL CAR causes gates to drop and warning lights to flash as it approaches crossing. It car-

it's not heavy enough to make the contact while rolling.

On the roof the car carries two red "marker" lights facing rearward and four amber caution lights forward. Above them is a red blinker, Standard automobile headlights bathe the track at night. Hand signal lamps, torpedoes and other regulation paraphernalia are carried in the trunk.

The car toots twice to go ahead, three

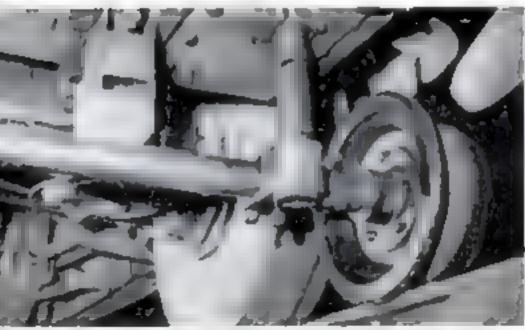
ries its own warning system for less versatile vehicles—air horns front and rear.

times to back up, and gives forth lustily with two longs, a short and a long as it approaches a grade crossing.

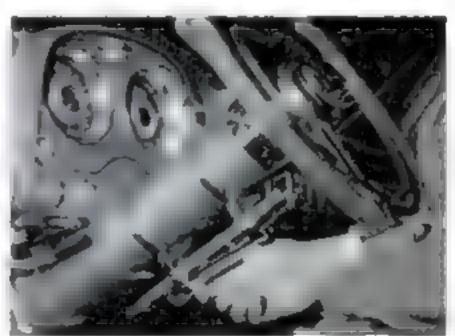
Everywhere the car is driven, it attracts crowds.

"Hey!" exclaimed an enchanted upstate New York automobile dealer, "How can I get some cars like this? I could sell a thousand."

It attracts the cops, too. Soon after "100" was put in service last October,



... which rides on the axle top. Finally



... a prong locks spoke of steering wheel.



With its flanged wheels tucked up, rail car joins mid-town traffic stream as a roadable sedan.

a police prowl car panted after it clear through the city of Troy, N. Y., to find out what kind of fool would be driving a car on the railroad tracks.

While it's driven by railroad brass, the master sergeant, so to speak, in charge of it is a reticent and gifted man named Lou Diffenbeck. Lou is an expert mechanic. They say of Lou that he can sit and listen to the beefs about an ailing diesel-electric locomotive, and nine times out of 10 diagnose the trouble without moving out of his chair.

Lou services "100." It's only a sideline with him, an added chore. It doesn't give him much trouble. His repairs usually consist of replacing things that get knocked off the undercarriage of the car. It's a ton and a quarter overweight, what with the special equipment needed to operate it, and despite hard springing, it "bottoms" on bumps.

Lou had a little transmission trouble when "100" went into service. Part of the drive—a standard Chrysler automatic—burned out when the car was backed up at 45 miles an hour. Examination showed that it wasn't the speed that was at fault but, instead, a bad installation. Nonetheless, "100" ever since has been placarded for a maximum of 15 miles an hour in reverse,

Normal servicing is no problem. Lou simply drives the car over one of the pits at the Central's roundhouse in Selkirk, N. Y.

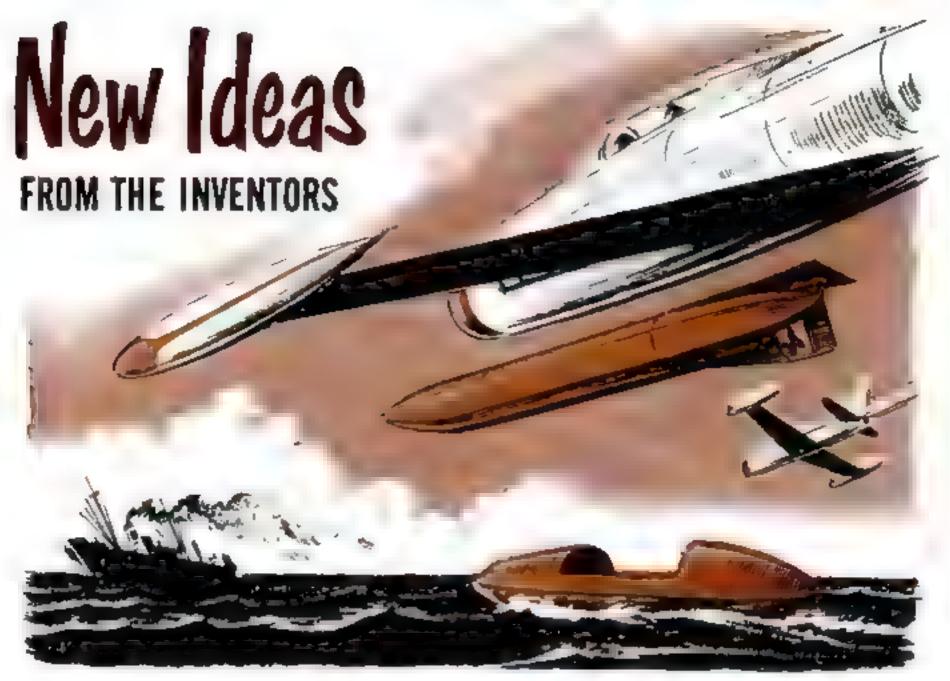
It would be abusing the truth to say that "100" rides like a dream. Driver and passengers feel the hard suspension—necessitated by the extra weight—on both highway and rails. But that's forgotten in the zany, and occasionally unnerving, experience of hurtling down a railroad track in an automobile at a mile a minute.

A tidy bit of work had to be done to the six-cylinder Chrysler to convert it to off-and-on rail use. An air compressor was installed under the hood to raise and lower the flanged wheels.

The pneumatic system is the same kind used for air-braking trucks. A reservoir two feet long and six inches in diameter, located under the car on the driver's side, stores the compressed air. When a pressure of 100 pounds to the square inch is reached, the compressor is stopped by unloader valves.

The air is piped to a distribution "header," and thence into lines leading to cylinders at the front and rear of the car. Valved into the bottoms or tops of the cylinders, it forces a piston up or

[Continued on page 260]



1 "Torpado" to Launch Rescue Boat. Foundering survivors of a ship or plane wreck might stand a better chance of rescue if lifeboats could be aimed right at them by low-flying planes. Fokled into bomblike

projectiles, several of these boats could be carried under the wings or in the bomb bay of a plane and dropped accurately on target. Compressed gas would inflate and unfold the "bombs" into seaworthy craft.



2 Three-Handed Watch to Aid Travel.
Commuters who go to work by Daylight
Saving Time but have to eatch trains on
Standard timetables would find this threehanded watch, showing both, a help in
keeping track of their schedules. Other
travelers who cross time zones could also
use it to avoid confusion



3 Tire Orip to Keep Hands Clean. Changing a tire would not be as dirty—or backbreaking—a job if you could get a good grip on a wheel without actually touching it. This wheel-lifting cradle, consisting of two handles attached to a flexible metal band, would make it easier for you to balance, raise, lower or carry a tire.

MORE New Ideas from the Inventors



4 Meter to Show Stopping Distance. Believing that many accidents happen because drivers fail to relate their road speed to unseen hazards ahead, this inventor would add auxiliary, foot-calibrated scales to a speedometer. They would translate speed into feet per second and show the safe stopping distance at any speed.



5 Electricity to Spark a Lighter. This flameless pocket lighter would use an electric heating coil like that in a car lighter to set your eigarettes aglow. It would be powered by a pair of miniature dry cells. A plunger would switch the coil on when the lid was raised, turn it off when the cap was snapped shut again.



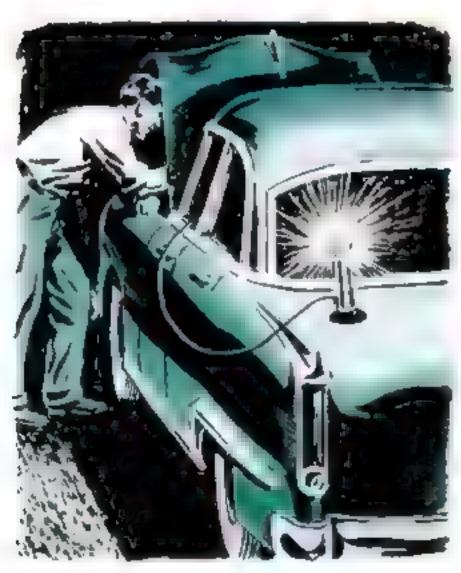
6 Two-Way Flash to Light Note Pad. Watchmen, guards, railroad checkers and others who have to make accurate written records outdoors usually have their hands full trying to read and write by the same light. This two-way flash would ease their

task by easting one beam forward and another back over the note pad at the same time. A clamp at the back of the light would support paper in writing position. A transparent plastic hood would keep sheets and pencil dry in wet weather.

US patents on these inventions have been granted for 1. L. M. Carts Ir and H. Felio, NYC., 2. R. Israel, Carte Modera, Calif., 3. J. Scuders Brookern N. J. 4. N. Radeeman, Lon Abgeles, 5. 4 Tooker Ir., Valentine, Nebr.; 6. A. Littreli, Kennewick Bash., 7. C. Petersen, Brooklyn, N.Y., E. E. Walper, Change, 9. C. Anderson 5: Charles Ill.



7 Vise to Fit in Vise. This "Vise Jockey." as it is called by its inventor, would adapt any large vise to hold small work. Shoulders on the pivoted arms would seat the clamp securely in the jaws of a conventional vise. And its own adjustable, self-aligning jaw would provide maximum grip for pieces of different size or shape.



Flasher to Work Off Lighter. By flashing its beacon on and off, this auto accessory would provide hard-to-miss warning of a stalled car. A plug at one end of its extension cord would fit the dash-lighter outlet. A suction cup would permit easy attachment of the signal to any convenient, prominent part of the car.



9 Dial to Line Up Wallpaper. A clip-on sperit level and angle computer might simplify the job of plumbing wallpaper. If this attachment were clipped to the edge of a sheet (or to a pipe or piece of structural timber), the bubble would tell when it was vertical. The level could also be rotated on a scale to measure angle of tilt.

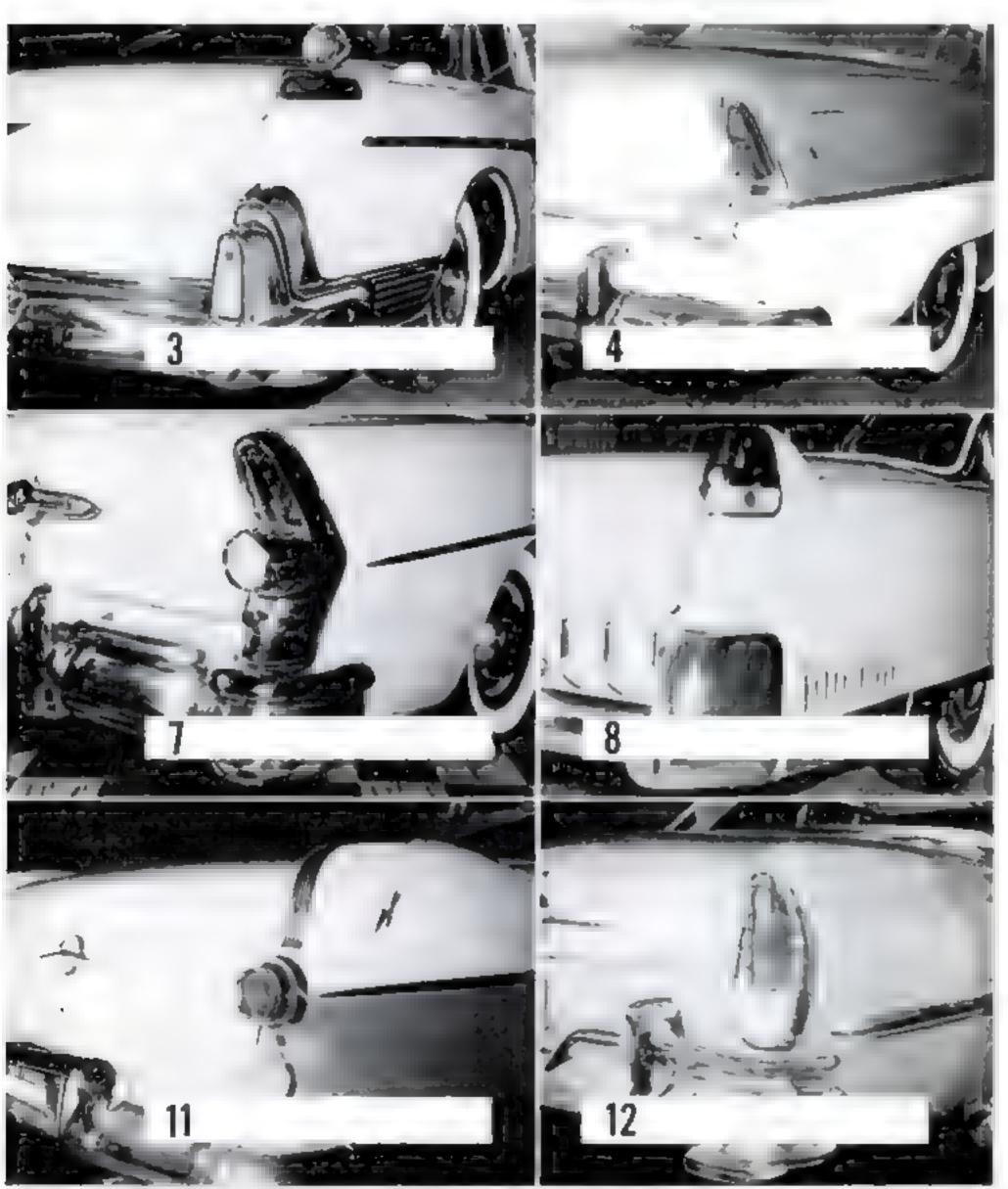
What New Car Just



5. Chrysler; 6. Ford; 7. Buick; 8. Cadillec; 9. De Soie; 10, Bodge; 11, Pomise; 12 Mereury.

Passed You?

BY NOW, you've seen all the 1955 cars. But how sharp were your eyes as you strolled through the showrooms—or thumbed through recent issues of PSM? Try to identify the make shown in each of these close-ups. Then check with the answers at the bottom.



Answers I, Cadilloc Eldurador Z. Oldsmobile; J. Chrysler's Imperials 4. Plymouth:

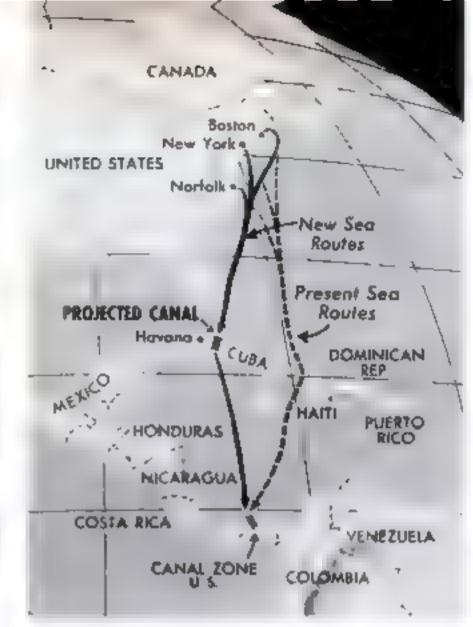
Ships to Sail Across Cuba as Canal Opens New Sea Routes

THE century-old dream of a trans-Cuba canal for ocean-going vessels seems about to come true. Granted a government concession to dig the 54.3-mile waterway, longer than the Panama Canal, a Cuban company foresees its completion in four years. U. S. engineers engaged by the firm are currently conducting a final one-year planning survey.

Benefiting Western Hemisphere trade and defense, the Cuba Canal would open new sea routes (map). It would also tap the rich resources of Cuba's interior, where ships could reach sugar mills and take

aboard their product in bulk.

The \$150,000,000 canal, a two-way sealevel waterway, would require no costly locks. It would have a channel at least 170 feet wide and of 48-foot depth, ample for deep-sea shipping.





Tiny Carrier Plane for U.S. Navy Packs Atom-Bomb Wallop

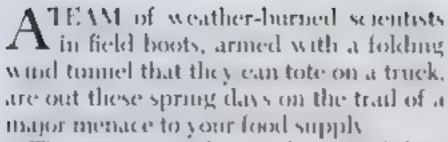
So sMALL that folding wings aren't required to store it below decks, this bantam U. S. Navy bomber, recently flown publicly for the first time, can carry an A-bomb. The

mighty midget is the A4D Douglas Skyhawk, now in production for service aboard carners. Its single jet engine gives it a top speed exceeding 600 m.p.h.

Can Science Stop Dust Storms?

There's hope that the answer may be "yes" as experts create gales in a tunnel to show farmers how they can tie down their soil.

By B. F. Sylvester



Their quarry is the grinding wind that, increasingly in recent years, has been

scouring the fertile topsoil from America's Great Plains and scattering it hundreds of imles away in choking dust storms.

Fifty million acres of cultivated land he at the mercy of these black blizzards. Last spring large sections of the U.S. suffered wind-blown soil losses that equalled the





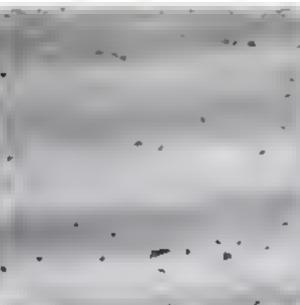
AS WIND SLOWS through the portable tunnel, dust samples are collected by suction hoses con-

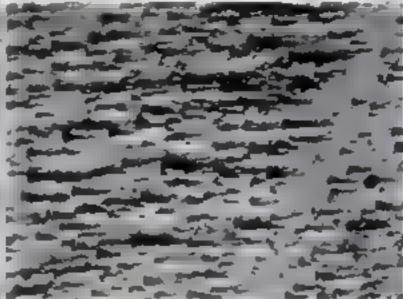
nected to sawed-off home-type vacuum cleaners. The amount of dust is also measured.

Soil men blow up a storm to duplicate Nature's action

WHITE STREAKS in this photo of a wind-tunnel dust storm show the leaping action of dirt particles—the flight patterns that cause erosion MAN-MADE WIND leaves rich farm land bare. Photograph at left below shows a patch of fertile soil before it was exposed to the groding action of wind. Then wind tunnel was turned on, stripping off most of the topsoil, leaving the barren patch shown in second photo. Projecting clods protected remaining particles.







dust-bowl ravages of the dirty Thirties. Then came the hottest, driest summer on record, followed by a dry fall, pointing to more trouble this year.

What can be done to stop this destruction of our greatest national resource?

Soil scientists at Manhattan, Kan., are now getting some of the answers to that question by creating test-tube dust storms in wind tunnels. By studying how dust storms start and how they wreak their havoc, these scientists are finding ways to help the farmer keep his dirt tied down when the big blows strike

The Manhattan dust-storm project, headquartered on the campus of Kansas State College, is sponsored by the U. S. Department of Agriculture and the college and state experimental stations. At its head are two world-known soil scientists, A. W. Zingg and Dr. W. S. Chepil.

Theirs is no stay-at-home job. At times they drive as much as 800 miles to stir up miniature dust storms with their portable wind tunnel,

This field model, 30 feet long, three feet wide and three feet high, is made of aluminum sections, open on the bottom. It can be set up on a farm in 15 minutes. The wind is provided by the power end of an old tractor and a three-foot ventilating fan. A governor and

manually operated vanes in front of the blower control velocities up to 40 miles an hour. The air is delivered through 324 two-inch aluminum tubes. These remove the whirl caused by the fan, straightening out the blast so that it simulates a natural wind as it roars through the tunnel and over the soil.

As the man-made wind whistles notsily away, the amount of soil blown out is
measured and samples are sucked up by
sawed-off home vacuum cleaners. When
all the soil that will blow off has been
removed, usually in less than half an
hour, the wind machine is moved to auother farm site. The amount of soil taken

from a single 90-square-foot plot covered by the tunnel has run as high as the equivalent of a real dust-storm loss of 1,000 tons an acre.

An important accomplishment of the scientists was learning the three main factors affecting wind erosion: make-up of the soil, surface toughness, and the amount of crop residue a farmer leaves as a cover.

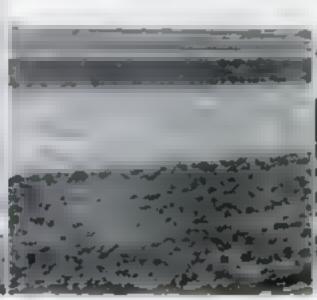
Almost any cover left on a field is a help, they have found. What they plug for, however, is a heavy stubble and straw cover up to 18 inches high. But even a farmer who has kept no cover is

[Continued on page 274]

These steps protect croplands against the ravaging wind

ASPHALT-EMULSION cover protects completely against wind. Light area, where film has been removed, shows the highly erodible soil below. ALTERNATE STRIPS of stubble and cover grass hold soil fairly well. After several years of drought, however, even these will fail to halt the damage. DEEP FURROWING is one workable solution. Ridges of windresisting clods do an excellent job of keeping the soil from being blown away.







LARGER laboratory wind tunnel has alternate glass panels. These enable Manhattan, Kan., soil scientists to study and photograph the birth of a dust storm from a breeze to a black blizzard. At far right can be seen a shelter belt of miniature trees. built to find out how much protection it will give a farmhouse and fields from the ravages of big blows. Wind velocities are measured by the instrument at left.





Automatic Shift on Camera Links Lens Opening, Shutter

YOU just flip open the case and punch buttons with a new camera that does almost everything but compose the picture. The Voigtlander Vitessa L, a 35-mm f 2, offers these automatic niceties.

 Flash built into the case lid. You can close the case with a bulb in the reflector.

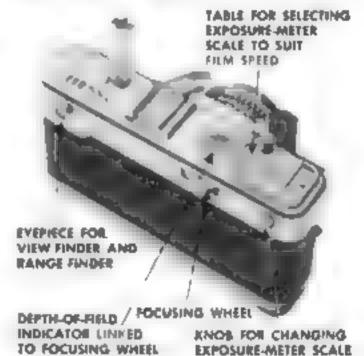
 The diaphragm opening automatically changes whenever you change shutter speed—and vice versa.

 You can make pictures as fast as you can push two buttons. One advances the film and cocks the shutter; the other trips the shutter.

The de luxe model shown above sells for about \$160 (without flush case). Willoughbys, 110 W. 32nd St., NYC, is the distributor.



new LVS Compur shutter with interconnected disphragm. You set "Light Value" lever to number given by builtin exposure meter. Shutter-speed setting then automatically adjusts disphragm to correct opening, which changes with shutter changes. To pick a desired lens opening, you move shutter setting. Same shutter is used on some other imported cameras, such as Ansco Super Regent, Rolleister.



They Say Now ..

Dr. J. Robert Oppenheimer: "The frontiers of science are separated now by long years of study, by specialized vocabularies, arts, techniques and knowledge from the common heritage even of a most civilized society; and anyone working at the frontier of such science is in that sense a very long way from home."

CRAWFORD H. GREENEWALT, PRESIDENT, DU PONT Co.: "America was built by people who wore rose-colored glasses."

Dr. Jerome W. Conn. University or Michigan: "From the time of our birth, we come out fighting; aware of it or not, we fight for survival until we take our last and final breath."

DR. ALAN GREGG, VICE-PRESIDENT, ROCKE-FELLER FOUNDATION; "The best thing on adviser does is to listen."

RICHARO WEIL JR., PRESIDENT, NATIONAL ASSOCIATION FOR MENTAL HEALTH: "Mental illness took a greater toll during the past year than ever before in our history."







Gun Shoots Plane's Tanks Free

Picors of supersonic planes no longer have to worry whether dropped bombs or jettisoned fuel tanks will fall away cleanly. A new gun shoots them off the airplane, as shown in the series of photos above. The ejection system is enclosed in an underwing housing to which the bomber tank is attached. Two cartridges exploding in the gun chamber open the fasteners and drive a piston down to kick the bomb or tank away. Patushin Aviation says it works even when a plane is flying upside down.



Nutshells Blast Dirt Off Jet

BIGGED up like a spaceman, this worker is using a combination of rice bulls and ground walnut shells to blast oft surface dirt on GE jet engines. The strange mixture, less hard than sand blasts out of the gun at nearly 1,000 miles an hour. Ar spraying downward from the top of the helmet keeps the operator comfortable



Barber Clippers Trim Plane Tail

The aircraft worker above is giving an airplane a haircut. He's trimming nylon brushes with an electric clipper just like the one your barber uses. The brushes are set between fixed and movable wing and tail surfaces on big Learstars. Sheared close, the bristles close apertures to prevent drag-producing air flow.

"At least," the Doc had said, "my horse



gas pumps before his Model Garage when the commotion began. Down the street at a dead gallop came a rickety, ancient buggy, drawn by an old pot-bellied gray mare. With every leap of the frantic horse the black, tasseled top of the rig threatened to collapse on the driver, who sat on the high seat, a tremendous meerschaum pipe clenched in his bewhiskered jaw, urging the horse to greater effort.

The clattering passage of this outfit effectively shattered the peace. Folks ran from stores and shops to look, and some even leaped into their cars and

took up pursuit.

"Doc Stanbury!" Gus Wilson gasped.

"Somebody must be sick."

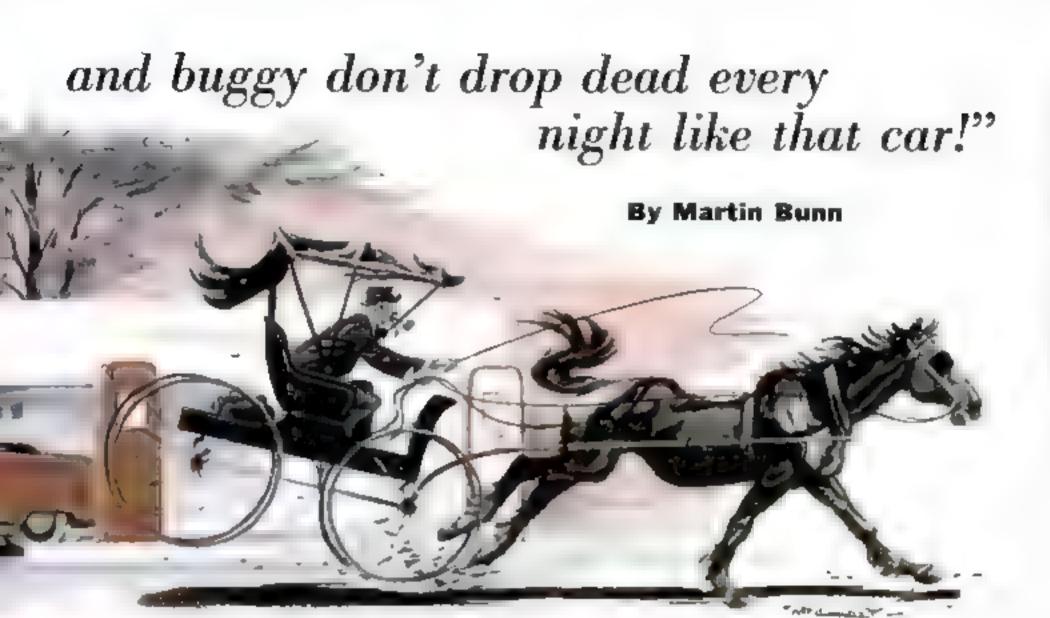
Stan Hicks, Gus's helper, was staring, too. "But Doc hasn't practiced medicine in years," he protested. "And why the horse? Doc owns a car."

"Hanged if I know," Gus said, moving to his car. "but I intend to find out. Take over for a little while, Stan."

Knowing Doc Stanbury as he did, Gus was inclined to believe that there was some sort of skulduggery involved in this horse-galloping business. Doc was quite a character about town. In the horse-and-buggy days Doc had been the town's only physician, a waspish, irascible man, smelling strongly of tobacco and disinfectant.

YET beneath Doc's rugged exterior lurked the warm, impish heart of a Huckleberry Finn. Doc was the person who had in exasperation squirted Mrs. Sam Hepworth in the face with a garden hose, to cure her of the fake heart attacks by which she held her meek husband under her thumb.

Doe had reluctantly pastured his beloved horse in favor of a car during his later years of practice. During the past three years his main activities had been built around hunting and fishing with his old friend, Todd Beacham, and playing



a Competitor

poker with some of the boys at the club.

Topping the first hill at the edge of town, Gus saw that the fleeing procession before him was streaming into Todd Beacham's farmyard. Perhaps he was wrong, Gus told himself, in thinking that Doc was up to some sort of trick. Maybe Todd Beacham was sick. Todd would surely call on Doc Stanbury rather than any of the younger doctors. But why would Stanbury travel there by horse? Why didn't he use his ear?

Gus had a hunch that he knew the answer. For the past few weeks Doe had been complaining loudly about town about the constant failure of a new battery which he had purchased from Roy Williams, who ran a newly established auto-supply house in town. The battery, according to Doe, went stone dead every few days while the car was in the garage overnight. Gus speeded up and joined the group in Beacham's yard.

"Who's sick, Doc?" someone asked.
"Is Beacham sick?"

"Of course I'm not sick." Beacham said from the front porch, "My cow's got the heaves."

The onlookers, who knew that Doc Stanbury would be insulted if called upon to treat a sick cow, stood in stunned silence. Then it began to dawn on them what this was all about, as it had long since dawned on Gus. A snicker arose here and there.

"Cow with the heaves!" one man laughed, "Wait till Williams hears this!"

Gus had heard enough. He turned away, his mind full of confused thoughts. Doe, as he had suspected, was up to something. Irritated by his constantly dead battery, he was taking revenge on the man who had sold it to him. With a flair for the spectacular, and with, perhaps, a subconscious yearning to gallop his horse through the streets once more as he had done as a young doctor, Doe had called his plight to the attention of the town and held Roy up to ridicule.

Without uttering one single word, and

with Todd Beacham's cooperation, of course, Doc had managed to intimate that he could get around town faster with his old horse and buggy than with a car equipped with one of Williams' batteries.

It was a brilliant stroke of publicity, and undoubtedly, to Doc, a good joke. But to Gus there was more to it than this. Roy Wilhams' auto-supply store was a small operation with low overhead. There were businessmen about

town who resented Roy's new business, and resented having to compete with him. Gus felt that around the poker table at the club, some of these businessmen might have needled Doc into his horse-and-buggy parade.

But would other people see this as clearly as Gus did?

He'd be hanged, Gus told himself, if he'd have any part of it. The thought sent the Model Garage owner to Roy Williams' shop, where he entered, looked Williams in the eye, and told him flatly that he had had no hand in the farce.

"I DIDN'T think you would, Gus," ■ Williams said evenly. "My brands of merchandise are new to folks and they don't trust them until they prove themselves out. Doc Stanbury bought my first battery, and since he's been complaining about it, I can't get anyone else to try one out. The worst part of it is that the more I try to straighten things out with Doc, the worse they get. I've exchanged batteries with him three times, and they all went dead at one time or another, while the car was parked overnight in his garage. This gives him a chance to claim that all my merchandise is phony. I'm sure there's a short in his car, If there is, I can't find it, and there's the rub. What can I do, Gus?"

"There's only one thing to do," Gus

told him grimly. "Hire a competent mechanic to get the facts. Either your batteries are no good, as Doc claims, or his car has a short. It's as simple as that."

"You're right, Gus," Williams conceded, "I'll get Doc to bring the car in to your garage."

THE next day. Doe Stanbury drove his big sedan in. He waved aside Gus's offer to drive him home, "Don't bother," he told the Model Garageman, "I've got

my rig around the corner. It's slow, but at least the horse and buggy don't drop dead every night like that car of mine!"

Working on the car later, Gus scratched his head in bewilderment. He was stuck. He could find no short in the car, and there seemed to be noth-

ing wrong with the battery.

The battery took and held a charge. It stood up under 300-ampere breakdown tests. Snapping the battery ground wire against the frame yielded not even the sign of a spark to indicate a short. Nor would any instrument in Gus's possession show a short. Gus checked out every wire for breaks or bare spots. He tightened all wiring terminals. The fuse in the electric clock was the right size, so the clock could not be suspected. Nevertheless, to make sure, for here was the only known drain on the battery overnight, Gus disconnected the clock.

Hoping that he had in some way overcome the trouble, he turned the car over to Doc. Two nights later the battery went stone dead.

This brought a new suspicion to Gus's mind. Was Doe leaving a switch on at night, to keep the farce alive? Gus began to feel like a fool.

"This deal," he told Stan Hicks, "has about got me stumped. It would be use-

[Continued on page 252]



"I guess it's all right to get out . . He seems friendly enough."



Installing a Room Air Conditioner

SWELTERING at home in hot weather is no longer necessary. You can install a room air conditioner in a halfhour without help, except to lift the heavy main unit, and with tools you already have in the house. And prices run lower than you might expect—from under \$200 to just over \$600, depending upon the size, make and the de luxe extras you may want.

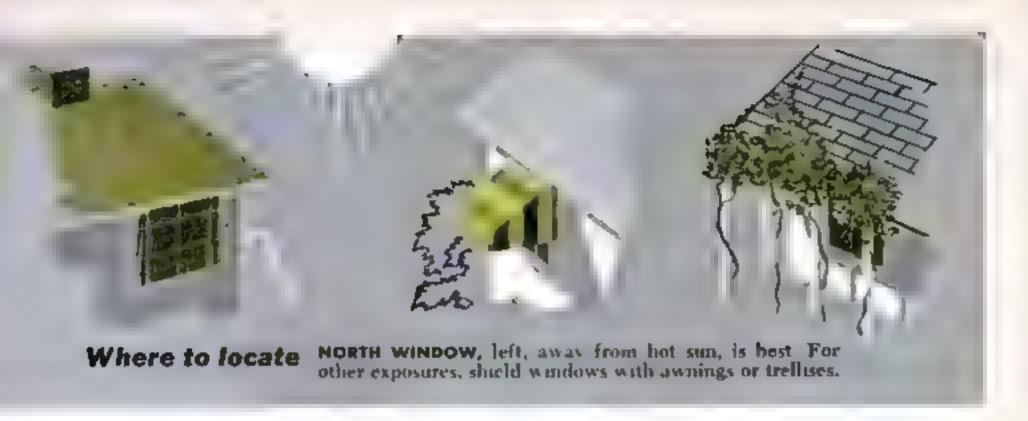
But give some thought before you buy one to operating efficiency and ultimate comfort. The location of the air conditioner, type of installation, size and ade-

	ITEM	YTITMAUQ	FACTOR (multiply by)		COOLING
	1. Window Area Exposed to Sun		Inside Shades	Outside Awnings	
	a. East, southeast or south		45 25 65 40 100 60 35 25 If windows have shades and awnings, use awning factor only.		
- The Control of the	2. All Windows Not Included in Item 1	sq. ft	14		
	3. Walls (lineal feet) a. Light construction, exposed to sun* b. Heavy construction, exposed to sun* c. Shaded walls or partitions (all walls not included in 3a or 3b) *Same exposure used in Item 1.	ft. ft.	90 50 30		
	4. Roof or Calling (one only) a. Roof, uninsulated b. Roof with 1" or more insulation c. Cailing, with occupied space above . d. Cailing, with attic space above	sq. fl. sq. fl. sq. fl. sq. fl.	16 7 3 10		*******
1 - C v	5. Floor (emit if an ground or over un- heated basement)	aq ft.	3		
20:0	6. People (number using reom) .	people	900		
- 10	7. Lights and Electrical Equipment in Use in Room .	walls	3		
Half-there .	8. Doors and Arches Continuously Open to Unconditioned Space (width)	fr	30	0	
ter anner -	9. Total Load			**** 1	

ON THE AVERAGE				
if your total comes te approximately	You need an air senditioner of			
4,200	1/2 hp.			
6,000	1/2 hp.			
8,500	% hp.			
10,500	1 hp.			
16,000	1½ hp.			

Finding the size conditioner you need

Sample problem: Assume you have a 12'-by-15' room with three exposures, east, south and west, and one 3'-by-5' window in each wall. You have both awnings and shades. Walls are of heavy construction. There is a ceiling with occupied space above, a floor over an unheated basement, and no open doors or arches. Three people use the room at one time. Electrical equipment takes 500 watts. Item 1 (15 x 60) is 900; item 2 (30 x 14) 420; item 3 (15 x 50 plus 39 x 30) 1,920; item 4 (180 x 3) 540; item 5, zero; item 6 (3 x 900) 2,700; item 7 (500 x 3) 1,500; item 8, zero. Total cooling load, 7,980. Chart at left shows that a ¾-hp. unit is needed.

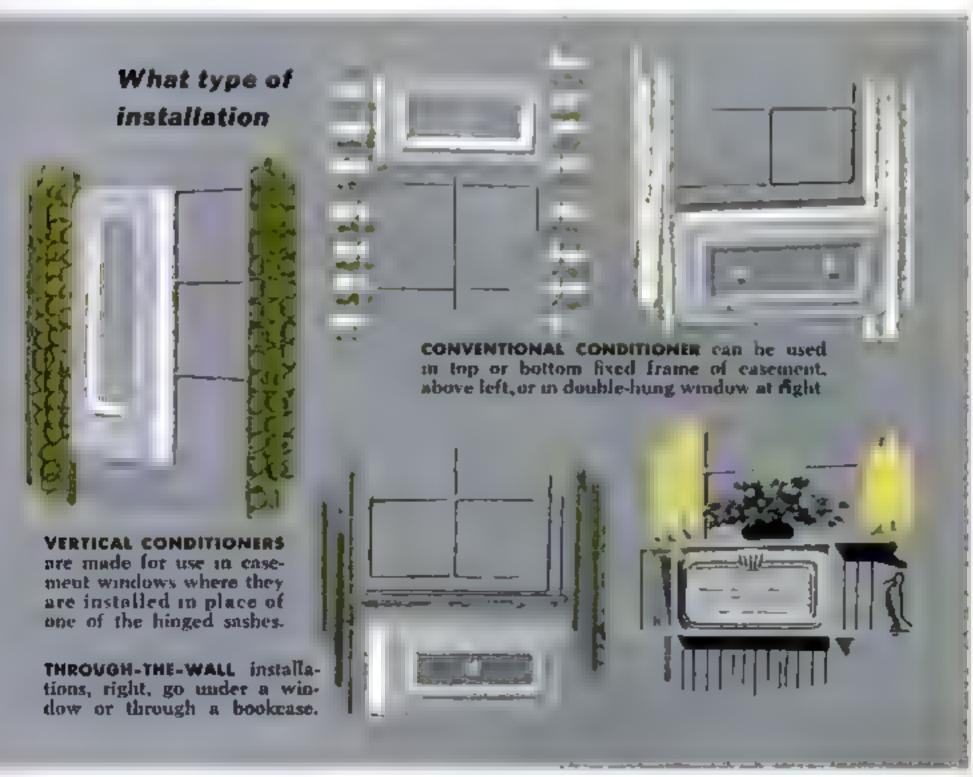


quate wiring are all important factors.

Selecting a location. If the room you want to condition is on the north or a shady side of the house, you are fortunate. This can mean an initial saving as well as lower operating costs by allowing you to use a smaller (and less expensive) model than would be required for a

western or southwestern exposure where you get the hottest and longest hours of the summer son

If the room isn't on the north, you can still make a saving by putting the conditioner in the window or wall least subject to sun. The cooler the air supply, the less work the unit will have to do



and the less it will cost for you to run it.

Shading the unit and all windows in the room will help. You can use awnings or overhanging trellises with leafy vines. If you don't like awnings or trellises, at least keep the shades drawn during the bright daylight hours.

What type of installation? Room air conditioners are commonly installed in windows, either conventional doublehung or casement. But installation through an outside wall is equally effi-

cient and is becoming popular.

A conventional model is used in a casement window that has a fixed frame at top or bottom. You remove this frame and put the unit in its place. Special vertical models are made to replace one of the hinged casement sashes.

A conventional unit can also be used in a wall installation, with a slight adaptation of the cabinet to make it conform with the plaster or trim. A bookcase against an outside wall affords a perfect location in many cases.

What size? This requires some study. A conditioner that is either too small or too big for the space it must cool will

do the job inelficiently.

To determine the cooling load your conditioner will carry, don't rely on a rule of thumb such as dividing floor area by 600 to find the horsepower it needs.

There are many considerations involved, and floor area is only one of them. Others include the number of windows in the room, the directions they face, whether awnings or plantings screen them from direct rays of the sun, wall construction and insulation, and even

the number of electric lights on and the average number of people in the room

at one time.

To size a room, as the experts say, fill the accompanying cooling-load chart, multiplying each item by the appropriate factor, and add the results.

Then select from the table the conditioner that will handle the total load with a little to spare. There are five basic sizes: %, %, %, 1 and 1% horsepower (or tons-the words are used interchangeably).

Load ratings vary slightly with manufacturers. Those in the table are average. Your dealer can give you exact ratings for models he handles, or you can get independent ratings from the American Society of Refrigerating Engineers.

Once you have selected the size conditioner you need, don't try to stretch it to cool a second room. If you want to include an extra area, such as a dining L at the end of a living room, figure the total space in the cooling load and install a suitable conditioner in a window or wall facing both areas.

Keep the doors to the room closedand the windows, too. You can't cool all outdoors, and it costs money to try.

Will you need new wiring? This depends on the size conditioner, but all require a separate fused circuit on which there is no other appliance or load.

The %- and %-hp. conditioners operate on 115 volts. Most X-hp, makes are available in both 115-volt and 230-volt models. All 1- and 1%-hp, models are 230 volts. Most manufacturers also put out their larger units in special voltages com-

> mon to many big apartment houses.

> You will, of course, need a convenient outlet. If an extension is necessary, don't use an ordinary apphance cord for a 115-volt %-hp., or larger, conditioner. Use No. 12-gauge wire at least. The separate circuit should also be

Is your wiring adequate?

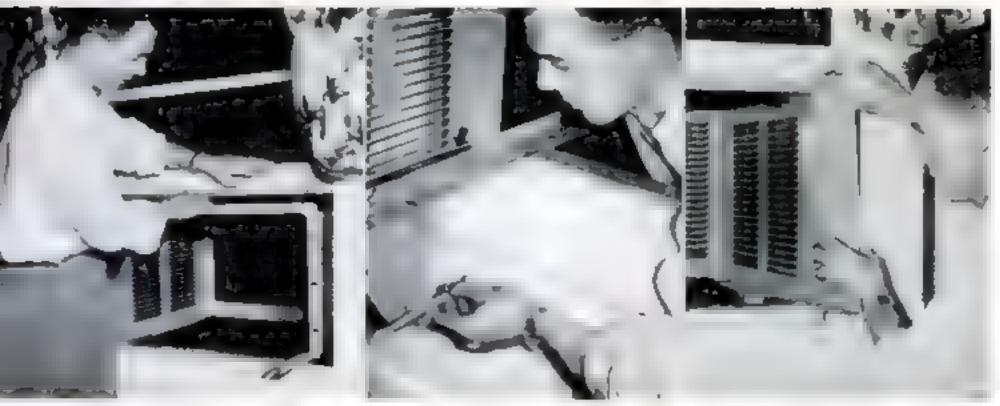
Size of Unit		Separate Circuit?	Minimum Wire Size			
15 hp.	115	Not necessary				
1 ₂ hp.	115	Yes, for bestresults	No. 14	15 amp.		
& hp.	115 or 230	Yes	No. 12	20 амр.		
1 hp	230	Yes	No 12	20 amp		
1 a hp.	230	Yes	No. 12	20 amp		

Requirements for air-conditioner models

of the heavy-duty type and should be equipped with a heavy-duty receptacle.

For a 230-volt model you will need a 230-volt circuit, with no other appliance on it, just for the conditioner. This is no great problem if you already own an electric stove or clothes dryer. You simp-

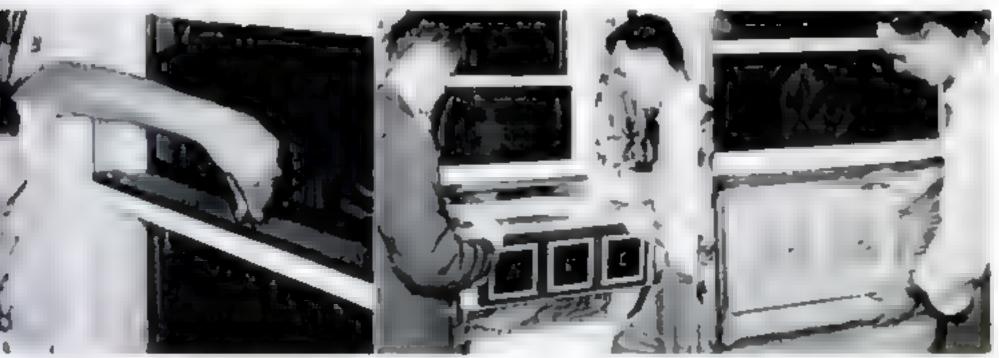
You can install your own room air conditioner



in typical installation cabinet is centered in window and held by sill clamps and sash.

CABINET IS ADJUSTED with level (arrow) by long bolt in support brackets against outside sill.

SPACER PANELS close openings on sides. Cabinet edges are then sealed with rubber strips.



warm air from entering through space between the two panes.

IT TAKES HELP to set main unit in place. Abutting parts of unit and cabinet are also scaled.

FINISHING TOUCH is screwing on panel and grille. Time: 30 min. (Photos by Westinghouse)

ly run a separate 230-volt fused circuit from the main electrical panel.

If you do not have 230 volts available at the panel, a line must be run to it from where the utility line enters the house. In most cases—and by law in most communities—this is a job for a licensed electrician.

How to install it. Window installations are easiest. Detailed instructions come with the conditioner, and steps vary but little with the make. You also get a complete kit containing all the accessories you need. Tools for the job are basic: screwdriver, wrench, awl, scissors, rule and level. You can have the

unit in operation half an hour after opening the packing crate.

Wall installation requires a little more work. After you cut a hole in the wall, at least 1" larger all around than the conditioner cabinet, the unit is mounted in the opening with the same supports supplied for window installation. Gaskets of wallboard, molding or similar material are used to fill in the opening at top and sides.

If the wall is thick, you may have to make the hole larger—for clearance of 2" or more at each side. This prevents blocking up the innermost louvers and lets the air circulate.—George H. Waltz Jr.



1. Guides Align Dowel Holes. There's no guesswork in lining up dowel holes with these markers. Holes are first drilled in one piece and steel pins slipped into them (above left). Around each pin is a sharpedged, loose-fitting collar. When the first

piece is tapped against the second one (center), the collars are left embedded exactly opposite the pins. The collars then guide the drill for making matching holes. The markers come in sets of six—three pairs for k", "" and "" dowels.

New Tools



2. Miter Makes Compound Cuts. Two protractor adjustments tilt this miter guide to both vertical and horizontal angles at the same time. The saw blade is held firmly to the guide by two permanent magnets set in the cast-aluminum frame.

Futther information about the tools shown on this page can be obtained from, I. C. C. Whittaker, St. Briar Cirf Road, Patteburgh 21 Pa., L. dimention Division, Box City Founder, It's Australia Relatington Calif.; 2. Pilot Fools, Inc., 225 Lafavette St. VIC 12, 4 Bonney Forge & Tool Works, Durkum and Meadom Sts., Allentown, Pa.

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3. Adapter Saves Taper Tools. Taper-shank tools with worn or broken tangs can be re-used with this spring-steel adapter.

The coil body locks instantly around a tool, yet you can remove it easily with a twist in the opposite direction. The adapter is available in sizes 1 to 5 to fit drills, reamers, end mills and other tools that have Morse-taper ratios from 1.2 to 5 6.



4. Holders Start Nuts. Starting nuts or bolts in hard-to-reach places is easy with these extension holders. Spring-wire cups at the ends of each rod grip square or hexhead nuts until they're threaded on, then pull off easily. The set of four holders takes eight sizes of metal, plastic or fiber nuts from 3/16" to 7/16".





What You Can Do with Bamboo

Nature supplies the shape and finish. All you do is split and slice the stuff into tables, planters and even drinking mugs.

By Jerry Parker

IN THE Orient, they use all of the bamboo but the rustle of its leaves Where you live, it can be good for many things besides fishing poles and plant stakes

As a change of pace—and also to show how versatile you can be—you might try making a few things out of this surprising material. From drinking mugs

MAY 1955 177



HACKSAW WORKS FINE for crosscutting bamboo, But be sure to ease up on pressure toward the end of the cut to avoid ragged edge.

CUTTING CURVES or notches is easy with a coping saw. For most projects, cuts are made on either side of the ringed node sections.

to picture-window trellises, they'll be different from anything else you've done.

The finish grows on it. Workshopwise a handsome hardwood, tough and immensely strong, bamboo is actually a relative of the grass family. Its hard, good-looking surface requires no finish, although you can paint, enamel or lacquer it with some very colorful results. The poles, called culms, vary in diameter from X" up. One variety grown in Georgia is guaranteed two years against cracking and splitting. It comes in 6' to 14' lengths and up to 3" in diameter. Prices run from 33 to 75 cents per foot."

Imported bamboo ranges up to 5" in diameter. Sizes up to 1" can be bought from large garden-supply houses, which

"My source was Thomas Crandell, P. O. Box 204, Atlanta 1, Ga.



plants are a natural in bamboo planters; the finish blends with growing things. Use 2½" or larger culm to make wall planter at right. Cut it at 45" about 5" above joint. Just below joint saw a 3"-long notch for second plant. Leave nodes in at center and bottom to hold soil. For third pocket, leave on third section.

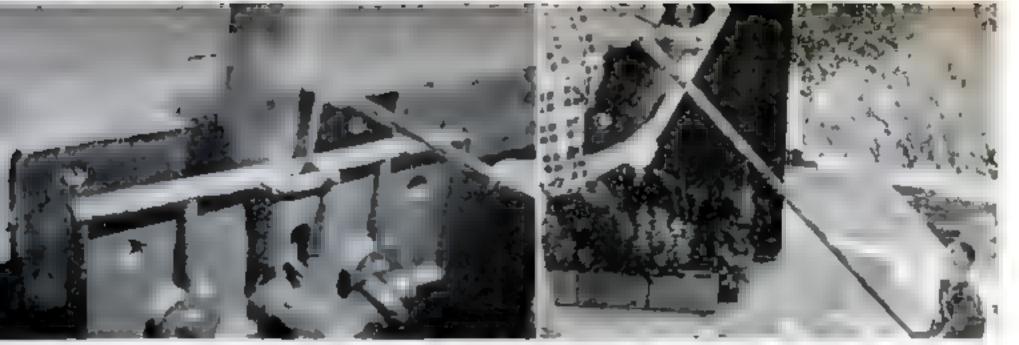
table Planter is made by cutting outside two joints and sawing out long notch between. Keep nodes in to contain soil. For feet, split bamboo ring in half, attach with small bolt.



MUG BOTTOMS grow naturally. The nodes or cross walls between sections form ready-made bottoms for tumblers, mugs and vases. Cut a 2½" or larger culm about 1" below and 5½" above a joint. A bamboo ring forms the handle. Sand the hard skin off joining surfaces and attach the handle with waterproof glue and a single small bolt, or with wire or cord binding. Bamboo vessels can be washed in hot water, but they should not be left to soak.



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HARD OUTER SKIN calls for care in starting holes true. Use a flat or twist drill—but never an auger bit, which will split stock.

MACHETE IS HANDY for splitting culms, but a kitchen knife will work, too, Knock out the nodes first by driving in pipe or rod.

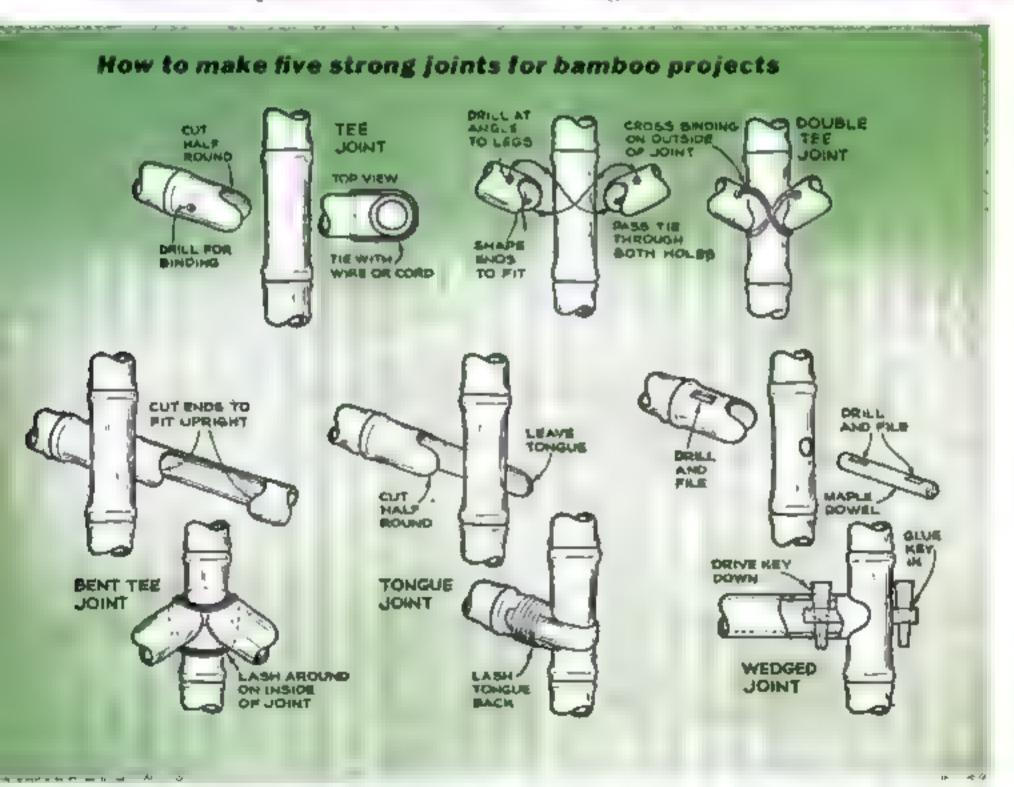
sell 4' to 7' poles as plant stakes, for as little as \$2.50 a hundred

Bamboo grows wild in many of our states, as far north as New York. If you have it in your own back yard, think about harvesting some for workshop uses. It will pay you dividends.

How to work it. The main thing to remember is to predrill holes in bamboo

for nails as well as screws. If you don't, it will split every time.

You can take advantage of this for making half- and quarter-rounds, strips, molding and the like. First knock out the nodes—the pith walls between the ringed sections—by ramming a pipe or rod through the culm. Split by tapping a big knife through from one end. The





BAMBOO TABLE is ideal for patio, porch or informal serving. It requires no finish. Top is 1¼" pine, trimmed on edges with bamboo.

bamboo will part before it. Should one side start splitting smaller than the other, hold the small half straight and bend the larger away from it.

Use fine-toothed blades for cutting. Node sections can be reduced with sand-paper, rasp or plane. Save scraps for such desirable trifles as napkin rings, match holders, salad spoons and forks.

You can bend it. After knocking out the nodes, advises Walter Lutz, bamboo artisan of Cleveland, pack the pole with sand and heat cautiously over charcoal or a stove burner. Bend with gentle pressure, reheating if necessary. Plunge it into cold water to fix the curve.

Raffia, caning, plastic lacing, cord or wire are used to bind ends. Wrap the binding tight, push the end under, and secure with cement or an escutcheon pin in a predrilled hole.



cult four Legs 27" long from 2" or larger culms. Avoiding the joints, drill 1/4" right-angle holes for stretchers cut 48" and 12" long from 1" culms. Miter ends to fit together inside the legs. Rasp or sand the ends to a taper.

IN PREDRICLED HOLES set a slender screw in each leg to hold to dowel plugs which have been coated with glue before mounting. Lay out top for plugs with care so that they fit leg assembly and are spaced evenly at edges.



GIUE AND NAIL wooden plugs, cut from a large dowel or closet pole, to the underside of the 18"-by-60" table top. These should be same size as the inside diameter of legs for a snug fit. Make the plugs at least 1" long.

spanish windlass, made by tying doubled rope around all four legs and twisting tight with short lengths of wood, serves as clamp to hold stretchers in place until glue has set. Table top, on floor, holds opposite leg ends tight.





New Brush-On Sealers Keep Basements Dry

Here's the inside dope on dampproofing your cellar. New masonry paints actually become part of the wall.

By Bernard Gladstone

TOUCH, new waterproofing paints let you seal moisture out of porous cellar walls with a brush. You can slap them on quickly, since there's nothing finicky about the way they're applied. And once up, they actually become a part of the wall.

For unusually serious water conditions, you can use the sealers in combination with a plaster base. For open cracks, there are new hydraulic cements that will plug up a hole while water's still running through it. The new sealers are called heavy-duty cement-base paints, and when you buy them make sure that you get the type that is specifically designed for waterproofing. Not all cement-base coatings are.

These paints come in powdered form and are mixed with water just before use. While they're normally applied as a thick coating, you can mix them to a plasterlike consistency and trowel them on.

If your walls are just damp because of an over-all seepage, the



use a spoon to force hydraulic cement in crack between wall and floor. Chisel out fine cracks enough to let cement in.

chances are that two brush coats will do the trick. But where you can actually see water dripping down over large areas of wall, you'll probably need one heavy trowel coat, followed by one brush coat.

To provide a good grip for the sealer, your masonry surfaces must be clean, dry and porous at the time you paint them. If they have already been treated with anything other than a cement-base paint, the pores may be too tightly sealed to let the new coating penetrate.

You can run a quick test by slopping on some water. If it seeps in and wets the

wall, you're all set to go. But if it just runs right off, the old surface will have to be removed first.

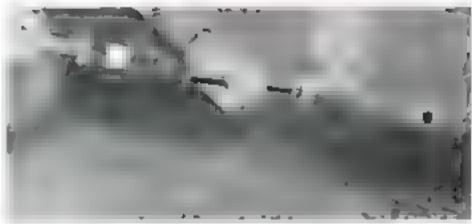
For oil paints, use a no-wash, semipaste remover, one that contains no wax and preferably one of the water-soluble types. Flow it on with a large brush, allow the paint to soften, and scrub it off with a wire brush and some mineral spirits. Then wash down the wall with a hot solution of trisodium phosphate and rinse with clear water.

For whitewash and other water-mixed paints, use muriatic acid, the wire-brush treatment, and the same bath of trisodium phosphate. You can get the phosphate at paint stores under the name of beetsol. Mix about five pounds with each gallon of water. These chemicals don't take kindly to eyes or skin, however, so wear goggles, gloves and a long-sleeved shirt, and wash up thoroughly afterward.

Patch cracks first. Before you start applying the sealer, all holes and cracks should be tightly plugged with one of the new quick-setting hydraulic cements. These come as a powder and are mixed

with water to a stiff puttylike consistency. After all openings have been patched, spot-prime them with a little of the same coating that you will use on the walls.

Where water is seeping right in through the masonry, the pressure must be relieved behind the wall by drilling weep holes along the bottom. After the water has drained out, you



DRILL WEEP HOLES to drain water at base of wall Use star drill or masonry bit in portable drill.

Sealer goes on quickly. Just before you're ready to start, wet down the wall with a fine hose spray to help draw the coating in. Also keep a pail of water and brush handy so that you can re-

moisten any spots that dry out before you get to them.

Mix only as much paint as you can use in an hour or two, since it sets up rapidly. Work it well into all cracks and pores, but don't fuss about brush streaks or lap marks—there won't be many

Before you put on a second coat, read the directions on the particular brand you have bought to see how much drying time is required, the correct proportions to use, and whether the coating needs to be kept damp while curing.

Plastering bad walls. Some walls may be so porous, cracked, crumbly, or otherwise defective that even the new heavy-duty coatings won't hold back the water. You can often solve this by replastering the walls before adding the scaler.

Since this means more work, try the sealer alone on at least one wall first to see what happens. And if you do decide to plaster, try that, too, on one wall before you undertake the entire job. If the wall is wet at the time, use the same system of drilling weep



PLASTER BASE seals bad walls. Mix sand and cement two to one, trowel on two 1/4" coats.

holes, only drive in short lengths of pipe to keep them open as you plaster around them.

Keep the inside dry, too. Many wet basements are made even wetter by warm, moist air that collects inside and condenses on the walls. Vent clothes dryers to the outdoors

If you have a shower, darkroom or other source of moisture, it can be vented with an exhaust fan, Cold-water pipes that "sweat" should be wrapped with special insulating tape.

If you still have a lot of condensation, you can get mexpensive chemical dehumidifiers at hardware stores that help absorb moisture. Or you can try to get your wife to stop hanging wet wash in the cellar—but that idea may not work.

END



Homemade Jet Pump Empties Pool

CHANNELED through a few pipe fittings, the flow from a garden hydrant can raise water from another point. Its velocity creates a partial vacuum, and atmospheric pressure does the rest. You can use such a jet pump to drain a wading or garden pool and to draw out sand and dirt from the bottom. Average line pressure will pump about 3 gal per minute to a height of 2'.

Turn the water on full force. Prime by blocking the discharge with your thumb and backing water into the suction line. Release your thumb, and the pump goes to work—Elbert Robberson, Port Washington, N. Y.



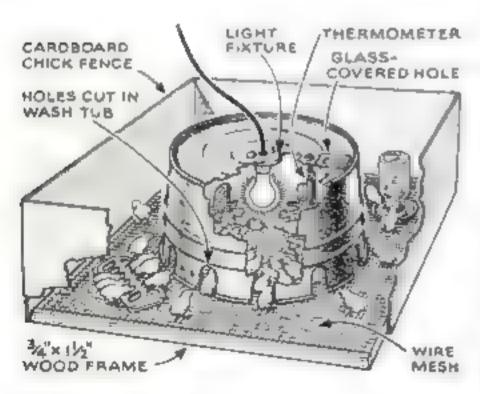
addition to hose. Body of pump is a 34"-to-14"-by-1/2" reducing tee. Discharge nozzle is a 4" length of 34" copper pipe. The female hose coupling is connected to 2" length of 1/2" copper pipe, and the suction side connects to a similar piece.



remove clamp sing from the hose coupling by prying or snipping it off. Then saw the hollow stem to 1/4" in length and slip it over the end of one 2" length of pipe. Bore or file out the small end of the tec until this pipe can be pushed all the way through.



CLEAN ALL OPENINGS of the tee with steel wool. Push the jet tube with the hose coupling in past the cross opening until it just enters the ¾" section. Then heat and flow solder into all joints. Push an 18" length of hose over the side pipe for the suction line.



You Can Raise Chicks In a Tub

For raising chicks on a small scale, this wash-tub brooder is a money-saving substitute for commercial equipment. An electric lamp provides heat. The size of the bulb needed depends upon the number of chicks and the prevailing outside temperature. Between 90° and 98° is usually recommended for the first month. Wire mesh over a wood frame makes cleaning easier.—Victor H. Lamoy, Upper Jay, N. Y.

▶▶▶You can reach the oil hole of an exhaust fan without removing the grid if you shp a drinking straw over the spout of a small oilcan.—Martin Koenig, Brooklyn, N. Y.



ACCESS TO TRUNK without unbooking outboard is important, makes picnic things readily available to the missus. Angle at which motor rides keeps residual water out of power head.

My Outhoard Rides on The Bumper

An afternoon's work will put your oil-dripping outboard where it can't hog valuable space, or mess up or gouge your luggage.

By. E. F. Lindsley

YOUR car trunk is no place to haul a bulky outboard. A bumper bracket solves the problem.

Before starting to build the bracket

shown in these photographs, I slung my motor on a rope to the garage rafters to get a picture of how it might ride best. I tried it upright, horizontally and finally at an angle.

Two faults were apparent at once with



the upright position. I couldn't carry the motor too low or the propeller and skeg might drag bottom as I started up a steep drive—or piled through a rutted backwoods road. If I shoved it up, there was no easy way of bracing to keep it out of the rear window in case of a sudden stop.

Slinging the motor horizontally looked better. But this had the same drawback as hauling it on its side inside the carwater left in the lower end could sneak into the highly polished cylinders.

Finding an angle. Finally, I tried cocking the motor up at an angle with the business end somewhat up in the air. That not only licked the water problem, but helped sneak the shank around the bumper guard.

The bracket can be built in an afternoon, I welded the joints, but rivets or bolts can be used. Just be sure the mount is husky enough to carry your motor.

MOTOR CLAMPS hold on hinged hardwood block as they do on boat transom. The closer you can mount unit without interfering with trunk lid, the less leverage you'll have on bumper.

The first rig I made was constructed of %" strap iron and latched onto the bumper like some light-duty trailer hitches. The result scared me, Every time I jiggled the motor, the bumper twisted and flexed like a lizard's spine. One thing was certain. If I should hit a chuck hole or lake-country trail, that heavy motor would build up a whopping load of inertia.

So I made another mount. Maybe the "by-1%" steel looks heavy, and tightening the bolts on the rear frame member may soil your clothes, but it's strong enough and it works,

Forming the mount. To bend the steel I used a vise, an overgrown monkey wrench, and a blowtorch to soften it up. If this seems too rough, the local blacksmith can do it in a hurry. The hinges can be the cheap chicken-coop variety.

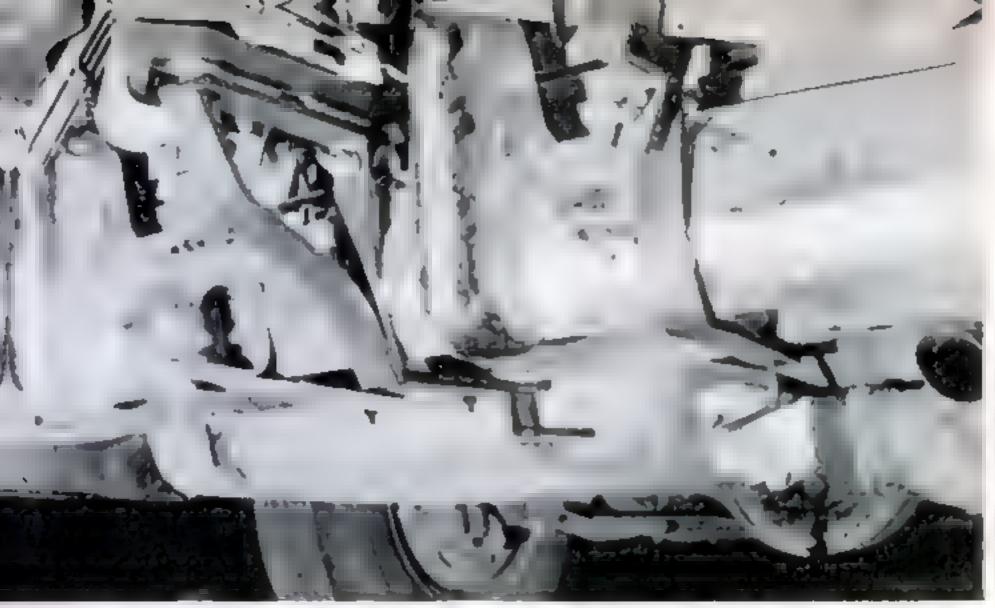
Don't sell yourself short on the clamp bolts that secure the support brackets

OUTSOARD PIN is locked to carrier by clamp held with wing nut. Wood insert, contoured to shape, is lined with inner-tube strips as are all metal surfaces contacting chrome.



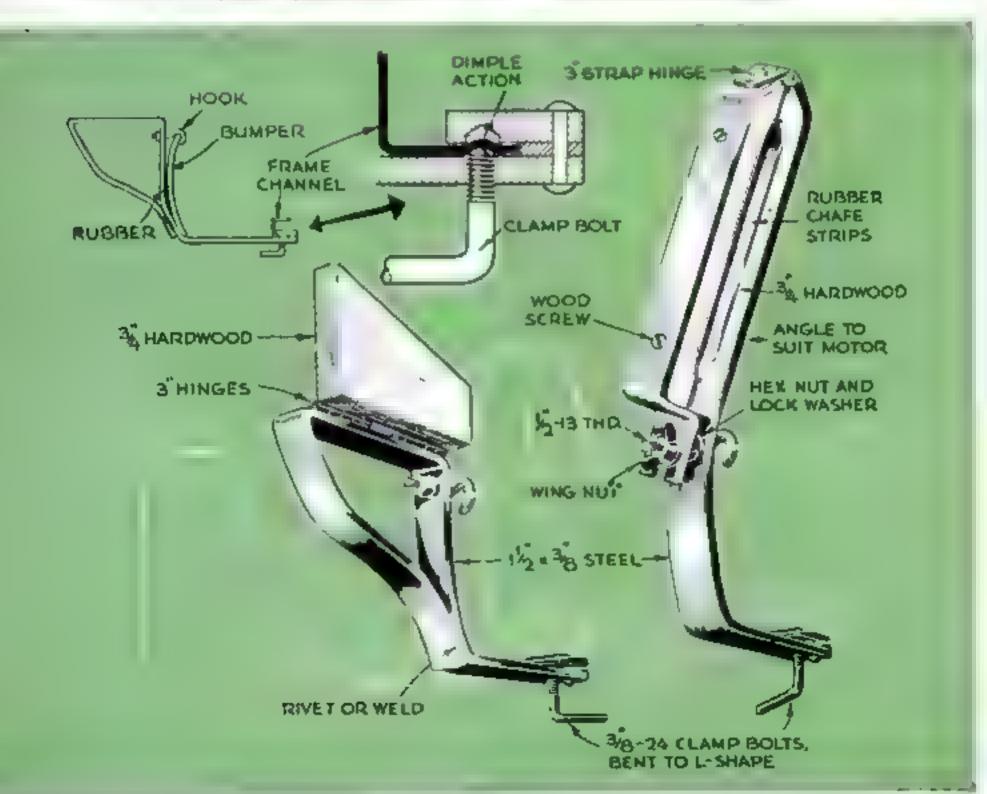


BE POPULAR SCIENCE



BOLTS clamping carrier brackets to the car frame must be pulled up tight against the frame

cross member. This absorbs road jults and prevents twist on the bumper



ALMANAC

FOR MOTORISTS

Pithy proverbs, provident counsel and omens and portents of interest to horseless-carriage operators.



>> If all the people who, in the course of changing a flat, discovered that the spare itself needed air, were laid end to end, there'd be an awful lot of people lying around

>>When the car is washed, there is often a powerful temptation on the part of the proud owner to "get out the wax and shine her up," Resist it-finish experts say you should always use a cleaning polish on a car before waxing it.

▶▶Is there a canary in your (engine? First places to lock in clurp-hunting are

the generator and water pump bearings. If they are intent, see if the distributor cam needs a dab of petroleum jelly

▶▶Says the Saturday-Morning Mechanics "A pile of troubles looking for a chance to happen' can be headed off by a look under the hood. You'll see wires that may chaft, filling sediment traps, weeping gaskets, and the loose air cleaner that makes that alarming knock,"

▶▶Aside to hitchhikers: Get out and walk if the man who picks you up is an angry driver, bent on "teaching that slob ahead a lesson." Blowups can be as risky as blowouts.



to the frame. I bent a couple of husky bolts into an L shape, and drilled and tapped the strap. If your car is shaped a little differently at this point, you may have to cook up a variation, but be sure you get a good, solid grip on the frame. These clamps take the twist off the bumper, and tie bumper and frame to-

gether for rigid support.

The jaw gimmick that clamps on the fin at the lower end of the outboard has a wood insert held by screws and lined with rubber. If you want to switch from one motor to another, it's a quick job to hew out a new insert to fit the new motor contour. In a pinch, I've taken out the wood, wrapped the fin with cloth to fill up the space, and locked the jaws down tight. These jaws are important since they keep the motor from swiveling and slamming against the trunk

It wouldn't have been too hard to bend up a couple of hooks to hold the brackets to the bumper, but the garden variety of porch-swing and clothesline eyebolts go for 15 cents. By sawing off a quarter

of the eye they do fine.

Cautions. Just to satisfy John Law, it's probably a good idea to hang the license plate where it's more or less readable. It's also probably a good idea to check your state's legal restrictions

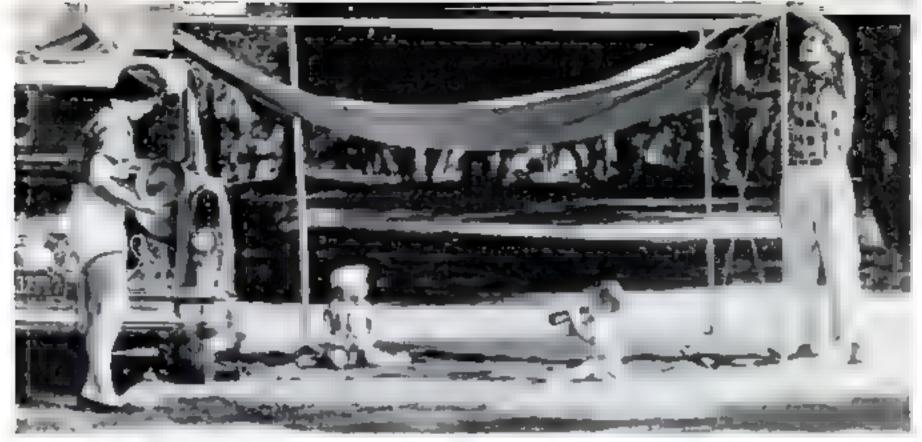
The only other problems are backing into trees and keeping tail-hugging drivers from sucking your outboard into

their grilles.

If you drive a lot in bad weather, or are plagued by dusty or muddy roads, a worth-while addition would be a canvas cover to cloak the rumble-riding outboard against the elements.

Enameling Old Surfaces

for can prevent cracking, crazing, alligatoring and chipping of enamel put on over an old surface. First clean off all dut. grease and wax with a strong solution of washing soda, and rinse with clear water. Then sand to cut through the gloss of old enamel, varnish or paint. If an oil gloss paint was used for the old surface, mix a little enamel with the first coat of enamel undercoater.



1. Car Tent Pulls Out. Setting up this 7%-by-10%-foot tent is a matter of a few minutes. You pull it out from the aluminum

carrier mounted on the car roof with straps or suction cups. There's room in the case for cots and other equipment.



2. Lighter Puffs on Cigarette. Press the button on this automatic lighter, and you get a light without taking your eyes off the road. It plugs into the regular dashboard lighter socket, and will work on all six-volt cars. No wiring is required

3. Hubcap Tool Prevents Marring. Prongs on this tool remove a hubcap or wheel disk without denting, and you can use the rub-



ber handle as a hammer in replacing them. The tool is also useful for removing front-wheel grease caps, transmission snaprings, door-hinge pins, chrome molding and for household jobs.

Further information on these new cas products can be obtained from: I. Kas Kamp Mfg. Co., 11680 McRean St., El Mante. Cauf.; 2. Skibby's, 3163 S. 12 St., Milwanker 15; 3. Presto Mfg. Co., Ltd., 302 Fort St., Wenning I. Con.; 4. Marmac Co., 79 W. Grand St., Mount Fernon, N. Y.; 5. Turkill Spring Co., 760 W. Polk St., Chicago ?

New for Your Car



An emergency car key in the form of a tie clasp will keep you from locking yourself out. Decorated with your car's crest, the key swivels off the tie har for use when it is needed.

5. Garage Buffer Absorbs Bumps. Both garage and car are protected from damage by this spring-steel buffer bolted to the wall with its adjustable crossbar at bumper height. The bar is painted in alumnum to give maximum light reflection.



Pointers on Building Garage Doors

By Edwin M. Love

You can use three basic frames to build just about any kind of over-head garage door you'd like. Faced with inexpensive siding or plywood, they can be styled to match your house or to give it a special touch.

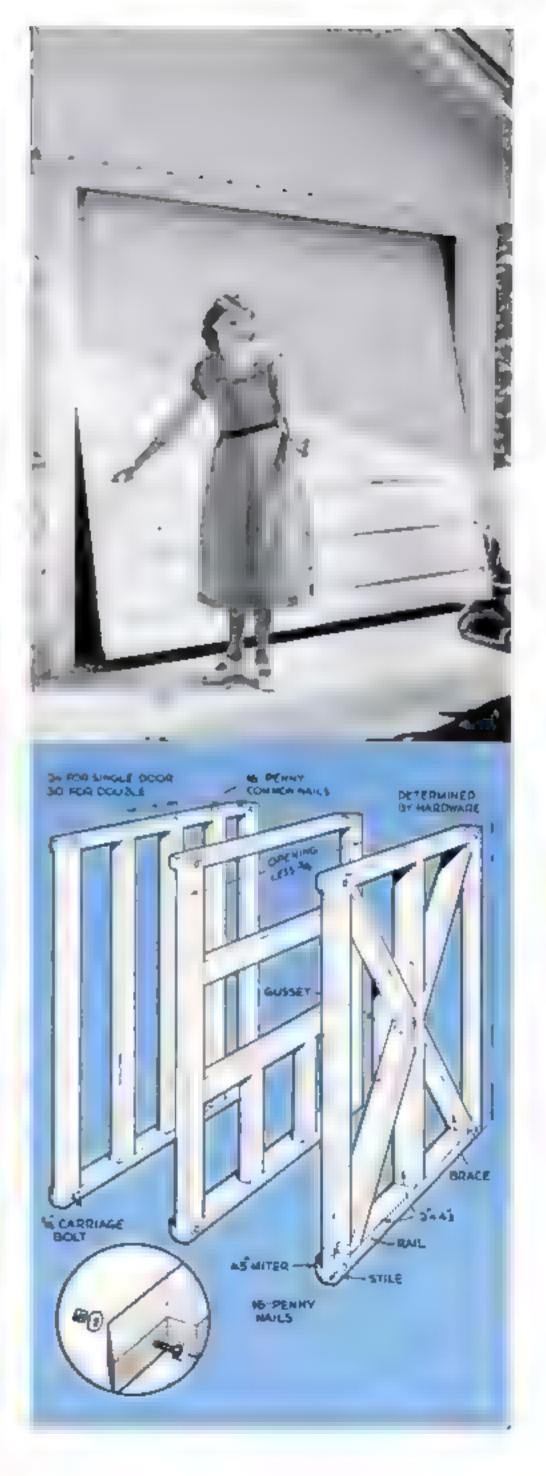
Two-by-four rails, set flatwise at the sides, are notched into stiles at the top and bottom and bolted together at the corners for strength. You can then nail in braces crosswise for vertical boards or run them up and down for horizontal or diagonal ones.

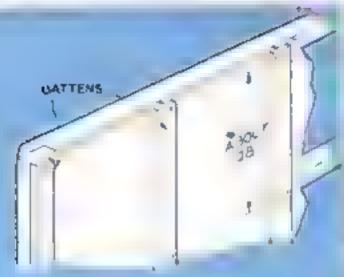
With the split frame, you can run the siding in two directions for a wainscoting effect, or combine siding with plywood. The X-braced frame provides corner supports for nailing on boards in concentric squares or rectangles. Or you can add a window or louver to help break up that bare-face look that many doors have

Selecting the hardware. Most jamb-type sets require a space of 8" to 13%" from the top of the door to the ceiling. If you haven't this much room, you can get special track sets that need as little as 1%".

There's also a pivot type that mounts on the side of the garage, but this can't be used where a narrow opening requires it to be set too far out from the wall.

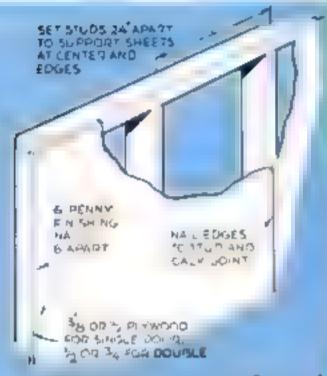
You'll need heavier hardware for a double door than for a single. Most sets come in only two sizes, but for



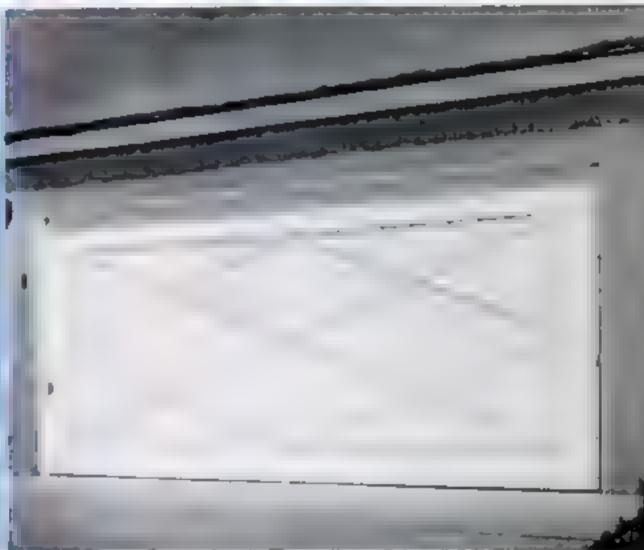


BOARD-AND-BATTEN treatment gives look of vertical paneling, but with less-expensive unmilled lumber. Cap boards \(\frac{1}{4}\)" for swelling; cover joints with one-by-two or one-by-three strips.





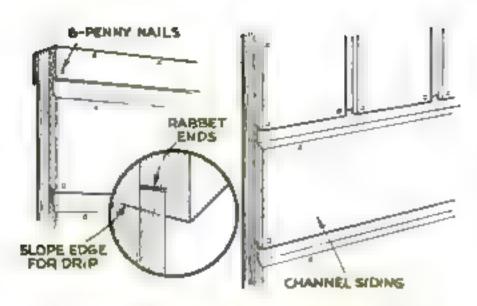
DIAMOND PATTERN of wood molding dresses up a plain door made by nailing plywood sheets over frame. Use cheap sheathing-grade plywood, but patch and fill it well before painting



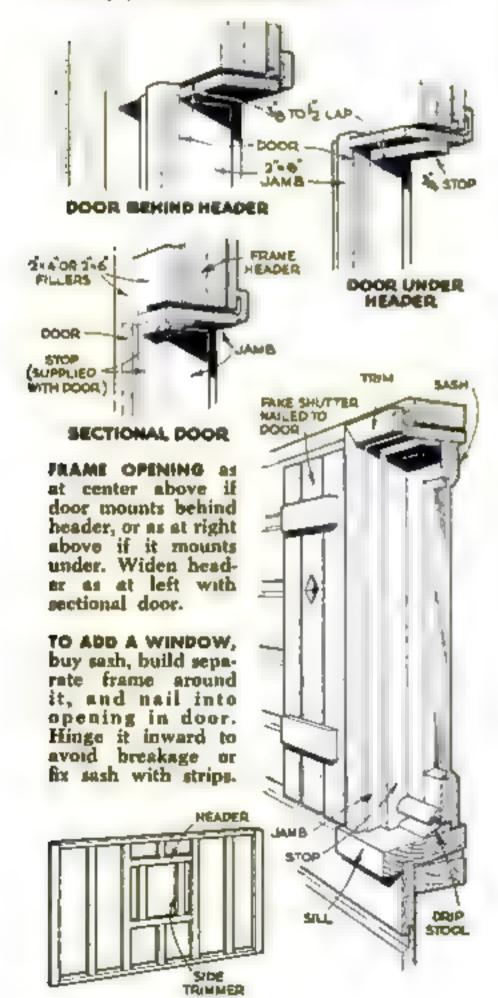


small scraps of plywood nailed to door frame and covered with checkerboard pattern of straps save waste. Sketch shows two ways you can notch fancy moldings to fit together.





NAIL SIDING TO FRAME for a door that blends with house walls. Countersink and putty over heads to prevent rusting. For wainscot effect at right, rabbet vertical boards over lip of horizontal one below and back up joint with cross brace.



others that are rated according to door weight, you can figure that a single door will run about 200 pounds and a double one twice that.

Framing the opening. All jambtype and some track-type mechanisms require new 2"-by-6" side jambs to provide a mounting base. You can spike these over the old 1" jambs if space permits, or remove the old ones first. Shim them plumb and cover the gap with new, wider trim.

While the header beam, if level, is sometimes used for the top jamb, it's usually best to nail up a new 1" board. For an inside-lap door, this must be narrower than the side jambs by the thickness of the door, so that the back is flush with the jamb edge.

Laying out your door. The 8' width for a single door is often stretched to 9' to give today's supercars more fender room, but 16' is still popular for a double. If need be, the standard height of 7' can be cut 6" without decapitating your car.

If you're working with an existing garage, take the dimensions directly from the opening after all new framing is in. Allow X" clearance at each side of the door and whatever is required at the top by the hardware. Build the door on the floor so you can be sure that all parts lie flat.

Putting on the jace. If you use siding, nail it on so that the joints line up with the siding on the garage. If you run it vertically, start at the center and work toward each side so that the edge pieces will come out equal in width.

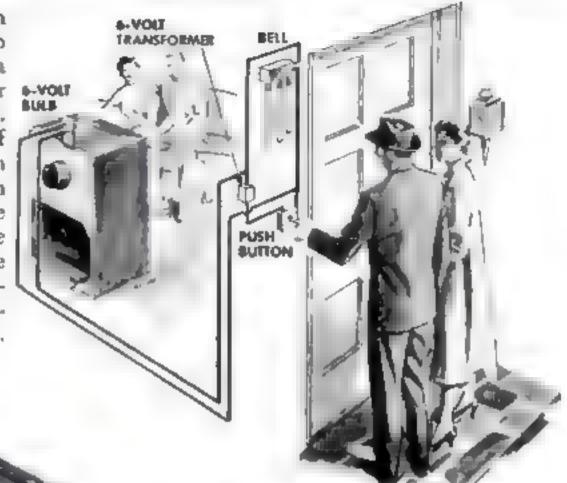
For a plywood facing, run both the frame members and the sheets vertically, making sure that there's a brace at each joint and one at the center of every 4'-wide panel.

Butt joints will crack and show unless you plan to cover them with moldings or battens. If you want a plain surface, miter the plywood edges at the splices, coat them with waterproof glue, and nail through the laps into the backing frame. END

Signal Light on Television Set Announces Arrival of Guests

HARD to hear the doorbell when you're deep in your favorite video show? Then a bit of bell wire, a small plastic socket and a 6- or 8-voit bulb can solve your problem.

Attach a bracket to the back of the TV set and mount the socket on it just above the cabinet. Attach two lengths of bell wire to the socket and run them around the baseboards to connect with the doorbell circuit. When the doorbell rings, the bulb will light up.— George P. Stein, Glendale, N. Y.

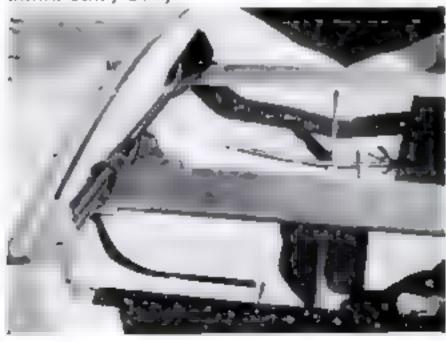


Tape Holds Bottles Upright

SMALL bottles won't tip over in a desk or vanity drawer if you secure them with a length of elastic tape. Press in thumbtacks at intervals to accommodate single bottles. -Norm Jacky, Fond du Lac, Wis.

Brackets Keep Oars Off Floor

OARS are out of the way but accessible if you mount an our bracket on each side of the rear seat. I shaped mine from 1"-by-6"-by-6" hardwood. Face them with a strip of tire casing or rubber shoe sole. Similar strips on a forward seat and inside the transom will prevent chafing.—Clinton R. Hull, Santa Ana, Calif.



Tennis Racket Is Table Stand

You can use an old tennis racket as a stand for an unusual end table in a den or playroom. Remove the strings and sand off the varnish; then noteh a disk of X" stock to fit the frame snugly. There's no danger of tipping if you glue the joints and drive in a slender finishing nail.

An 8"-by-9" piece of "weneer plywood makes a sturdy base. Bore to the shorter diameter of the octagonal handle, and rasp to fit. Glue in with or without the shoe. —Clifton Morris, Albuquerque, N. M.



An Easy Chair for Outdoor Living

Easy to loaf in and easy to make, you can put it together over a weekend.



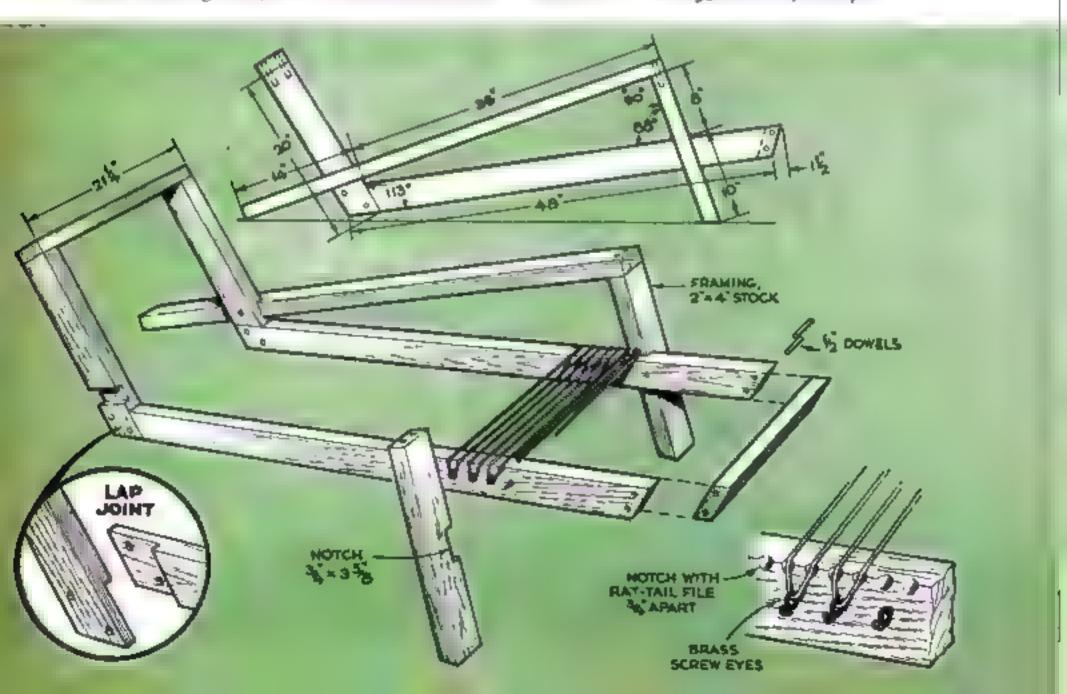
THIS surprisingly comfortable outdoor chaise longue is a simple construction of two-by-fours and clothesline. A fast worker might relax in it the same day he actually began the job.

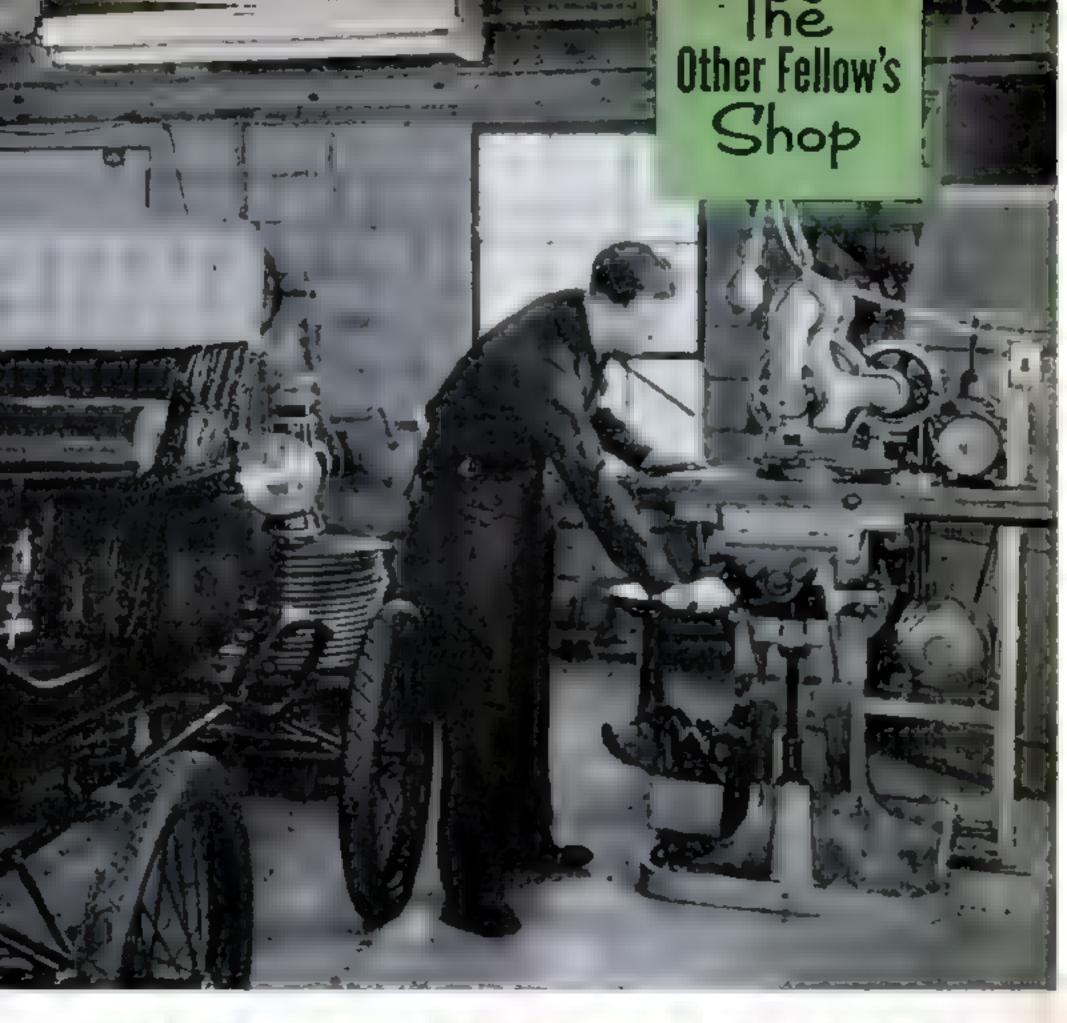
Use selected, vertical-grain pine or fir for the frame. Assemble the back rest and seat frame first, and then the arms and legs.

Note that the front legs and back uprights are notched for mating pieces. Except for these joints, which are fastened with glue and wood screws, all are doweled and glued, with the dowel holes

bored from the faces. This makes it easy for you to match holes and produces a pleasing effect of pegged joints. Use waterproof glue. Finish is applied before lacing.

Use high-grade cotton line that has been stretched on pulleys overnight with a bucket of sand for a weight. Knot the end and lace taut through screw eyes. You need about 130' for the seat and at least 52' for the back. Lashed shorter lengths may be used if the joined ends are stapled against solid wood to relieve strain.—Hi Sibley, Nuevo, Calif.





He's Building a Steam Car

Ray Boss works both ends of the scale: from full-size gas and steam cars down to tiny, incredibly detailed models.

By Harry Walton

OFTEX it's because a thing doesn't look possible that Ray Boss of New London Conn , tries it When it's done, he goes on to something equally unlikely, such as a live-steam locomotive in TT gauge

A serious young chap, he's only 27), Boss has been at it since his early teens. He's a man with two interests, steam cars and numature models, and, not illogically, he has two workshops. One in the basement as for "little

stuff." It has a 10" quick-change lathe. bench milling machine, drill press, jig-saw, grinder and the usual small tools.

His back-yard shop, housed in a 24-by-40-foot building, consists of sterner stuff. Boss built the place of concrete blocks (he did the wiring, too). Big enough to hold several cars, it is out-fitted with two lathes (the larger a gapbed type that swings a 16" faceplate), a factory-size milling machine, drill press, welding equipment, arbor press and heating plant. Here Boss works on cars or other big jobs

Employed as a skilled assembler at the Electric Boat Company plant, Boss prefers the late-afternoon-to-midnight shift because it gives him more time for his hobbies. He manages about four hours a day in his own shops. With two or

This is one of a series of articles about outstanding home workshops. See POPULAR Science Monthly next issue for a story on another fellow's shop.

three projects always under way, the time goes quickly.

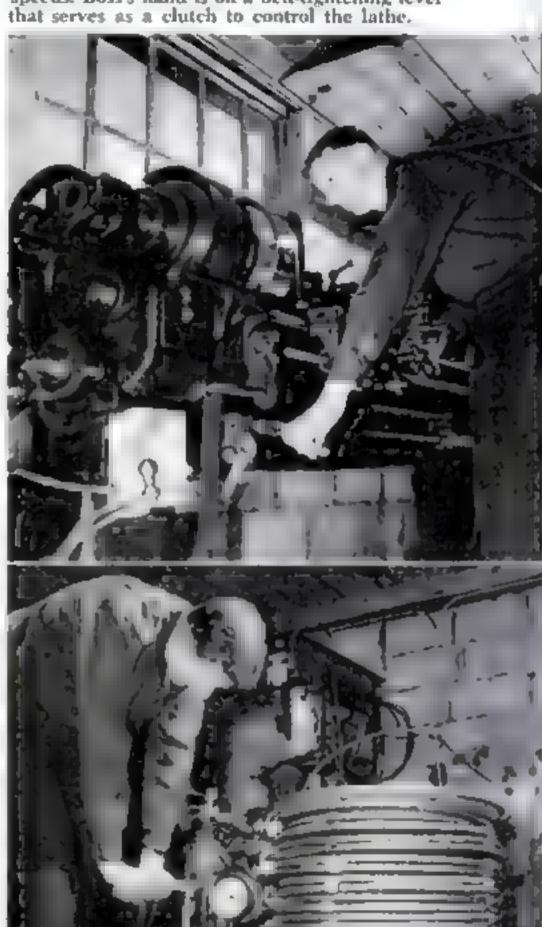
When Leo Reagan, a prominent local citizen, bought a 1900 Locomobile steamer, he found ordinary garage mechanics unable to cope with its intricate plumbing. After some costly blunders, the job came to Boss.

He took the car apart, repaired defective parts or made new ones, and rebuilt it. He then refinished it expertly, even to pin stripes on the spring leaves.

But what Boss would really like to make is a modern steam car. He feels that such a machine, built with today's superior materials and taking advantage of decades of automobile know-how, should be superior to gasoline cars on several counts. Since Detroit isn't turning out any, Boss is building his own.

He plans to get a running start by using the frame, wheels and body of a Henry J he has. But he will remove the engine and transmission to install a homemade steam power plant and a monotube steam generator. This he has

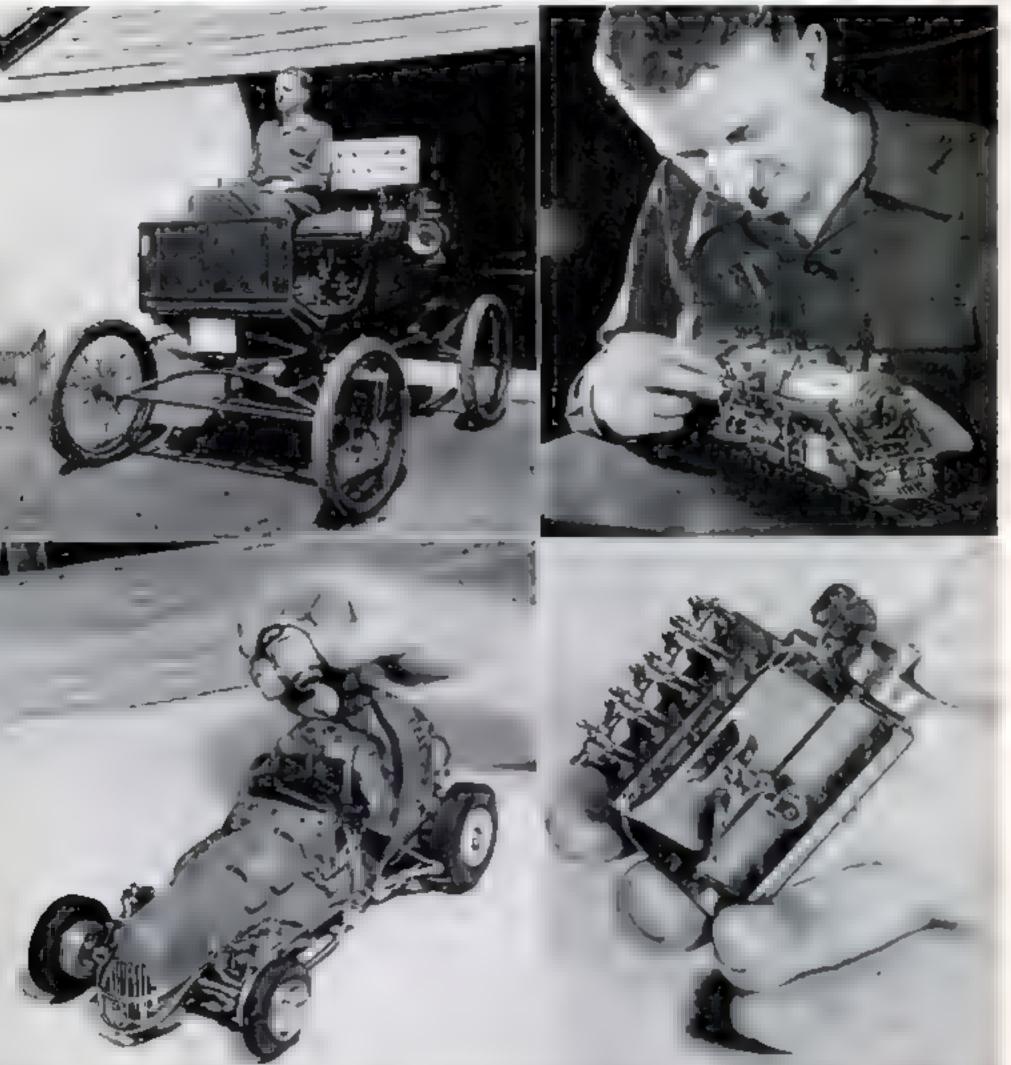
GAP-SED LATH", one of three that Boss uses, has ways that can be slid away from the headstock when extra-large work is to be swung. It was on this that he wound the coils (at bottom of page) for the steam generator he plans to use in a car A Chrysler auto transmission varies spindle speeds. Boss's hand is on a belt-tightening lever that serves as a clutch to control the lathe.



conto power. Monotube steam generator is designed to convert a Henry J to steam. It consists of eight sections of %" steel tubing, each having two coils wound in opposite directions. With a homemade pump, Boss here applies 2,000 lb. of hydraulic pressure to test the assembly. It has 70 sq. ft. of heating surface, and will be heated by a gan-type burner.

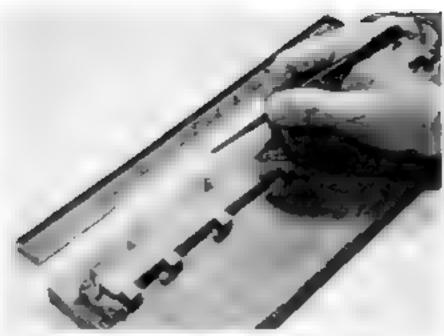
1900 LOCOMOBILE STEAMER was rebuilt and refinished like new by Boss. Its noncondensing power plant is good for about 25 miles on a filling of water. The boiler and two-evlinder engine are under the seat. Controls include a steering bar, throttle, foot brake and valve cutoff. Now that the steam buggy is huished, Boss is making a working model of it.

LIVE-STEAM LOCOMOTIVE has run many scale miles on Boss's O-gauge cellar pike. It was originally fired by an alcohol torch, but is being converted to burn butane gas. The cylinders are 12" bore and have slide valves worked by Walschaert gear. The duplex steam pump (near finger) puts water into the boder while engine is under steam, so it can make long runs.

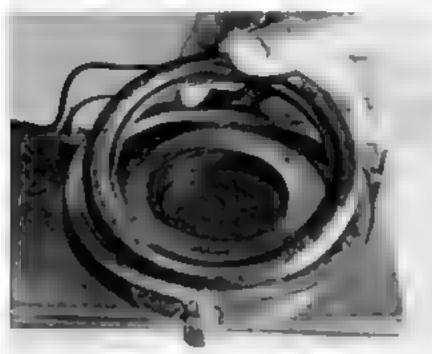


MODEL RACING CAR above has a fully sprung front end. An Arden 499-cu.-in. engine is built into the driver's body, brass head unscrews for access to the spark plug. A larger racing car made by Boss has full sprunging, welded wire wheely and a real carburetor. He runs them in the basement, where they are tethered to a pole by a ball-bearing swivel.

MIDGET GAS ENGINE, a four-cylinder water-cooled type, is ¼" bore and stroke. Pistons are cast iron, with 1/32" hollow wrist pins and bushed rods. The camshaft was filed to shape and case-bardened. Tappets are adjustable. The shaft runs in ball bearings. Spark plugs don't come small enough: Boss made each by turning down 136 mica disks on a metal stem.



LAST-DITCH REALISM. To duplicate antique tire trend for a scale model, Boss cut words NON and SKID—24 of each—from thin brass, then pinned them into a metal tray (in rear above), laid in copper tubing, and poured in type metal. Result is a vulcanizing mold (under hand).



TIRE CARCASS, complete to trademark and tire size in relicf, was tooled out of metal and used as the pattern for another type-metal mold. Uncured rubber was clamped into both molds and vulcanized by passing steam through the embedded tubing, forming tread and carcass.



TREAD WAS CEMENTED to careass to produce the model tire, here shown against the real thing for comparison. Spokes for the car's wire wheels are .030" florist's pins, threaded 112 threads per inch with a homemade die to screw into tapped holes in the metal rims.

already made of stainless-steel tubing. To fire it, Boss plans to use a standard furnace oil burner converted to 12-volt operation. The burner will work into a combustion chamber at the top of the boiler coils, with the "chimney" underneath. He believes it will burn fuel oil, gasoline or kerosene interchangeably.

Two thermostats are to control the burner, one to cut out when coil temperature reaches a certain maximum limit, the other when steam pressure gets up to several hundred pounds. The boiler will be fed with water automatically by an electric pump, requiring no attention.

Boss expects to take a year to build the engine, a pancake four-cylinder type with single-acting cylinders and poppet valves. He will probably use motorcycle barrels and parts of auto engines.

Instead of exhausting steam to the atmosphere (which would require a big water supply and frequent stops for replenishment), the engine will exhaust into a condenser. This will probably be an auto radiator mounted in the usual position in front. As the exhaust steam returns to water, it will produce a vacuum that will boost engine power, and the water will be recirculated to the boiler for further use.

In a gasoline phase, Boss revamped a Crosley Hotshot by installing a Ford engine and transmission, a shortened Ford rear end, Mercury front axle and brakes, MG wheel hubs, and wheels of an Italian make. To facilitate the job, he casually cut the body apart behind the seat and later welded it back together. This automotive hybrid has run 11.000 miles to date.

Working at the other end of the scale, Boss builds superb models in miniature. A current project is a 1"-to-the-foot scale job of the Locomobile he rebuilt. Most modelmakers would be content with tires of plain rubber tubing; a few might turn wooden tires and carve the tread on them. But perhaps only Boss would make them by vulcanizing rubber in homemade steam-heated molds, as shown in the photos on this page.

[Continued on page 262]

How to Use Your Dimmer Switch



A "ONE-EYED" DRIVER may not know that one of his lamps is shot. It's a courtesy of the road to flick your own headlights a couple of times to singlest to him that something is wrong



OUT and your bims such out and your lights on and off momentarily to tell an approaching driver that you have troubles—and are not really the dope he may think you are.



ON THE CREST OF A HILL or on a turn, the glow of headlights tips you off that a car is coming it via reforement of the art of dropping your beam to hit the switch before the other car comes into view.

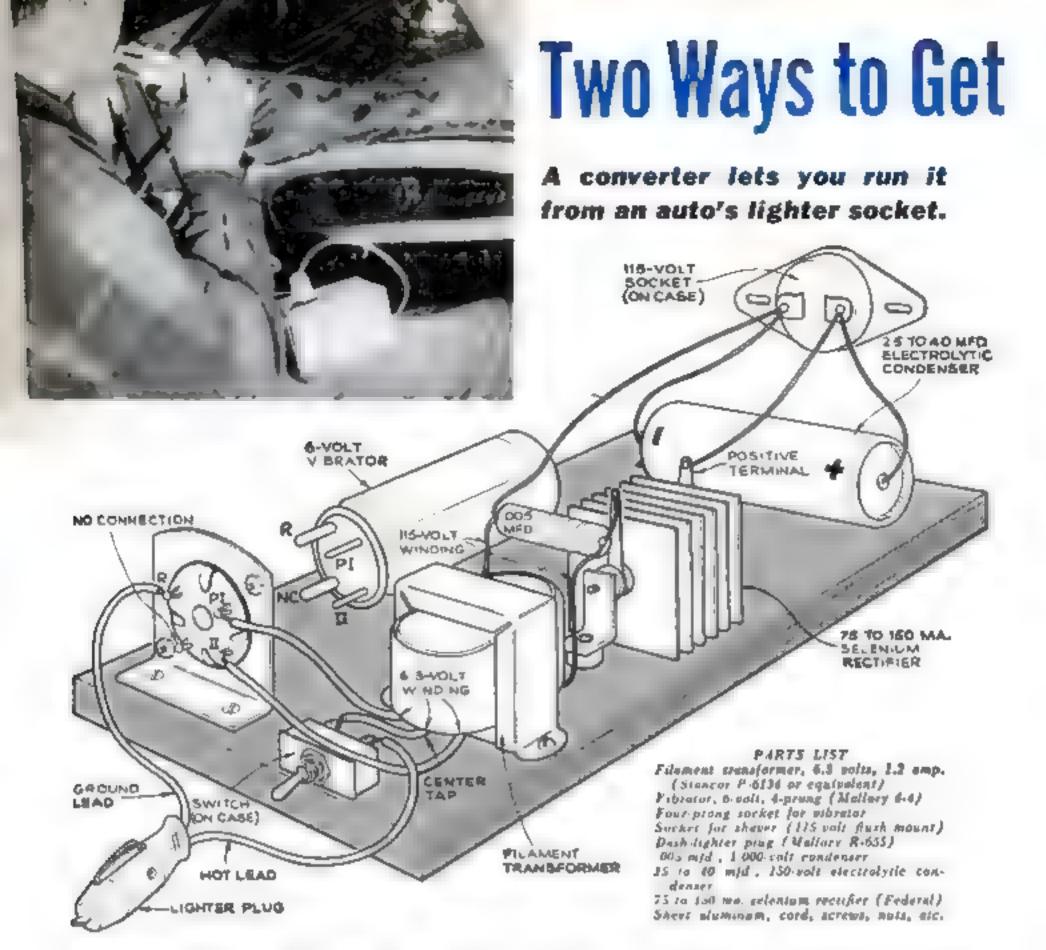
WHEN HIGH BEAMS BUIND YOU, it's perfectly acceptable to flick your own brights a couple of times to modge the other guy's memory. But blasting with your own high beam puts you among the fools who use the highways, some of them now dead. You should remember that a blinded driver instinctively pulls away from the edge of the road—into traffic



WHILE TRAILING ANOTHER CAR, remember to switch down your beam to take the glare out of his mirror—a courtesy you would certainly appreciate if your positions were reversed. A trailing car's high beams can trouble you even if it's quite a distance behind.



READY TO PASS A CAR, flick your lights up and down. Keep them down until you are abreast of him, then kick them to bright. If the other driver is as thoughtful as you, he will kick his down as you cut back in.



ONCE your skin loves the touch of an electric shaver, you may dread using a blade on vacation.

With this midget converter my electric shaver plugs into the car cigarettelighter socket to whisk away whiskers just as at home.

Parts for it cost less than five bucks. The gadget paid for itself on a five-week camping trip. Now I keep a shaver in the glove compartment to use while my wife drives me to the train. This dodge gives me five minutes' extra sack time.

A small radio filament transformer, connected backwards, boosts the battery potential to about 115 volts. The rectifier converts this back to direct current, and the big filter condenser smooths out the

humps in it. Don't omit the little .005-mfd. condenser across the transformer; it reduces arcing in the shaver motor.

I mounted the transformer and condenser on a 4%"-square wood base, with a right-angle bracket to support the condenser. A simple boxlike cover was bent from aluminum to fit the base, with a hole in its top for the shaver socket. Another hole admits the cord from the lighter socket.

Don't plug in and switch on the converter unless the shaver is plugged in. And resist the impulse to take along your TV set or let your wife use an electric iron. The converter is only for flea-power jobs such as shaving your chin.—Hugh Harvey, Scarsdale, N. Y.

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More from an Electric Shaver

A simple booster-rectifier will pep one up on house current.

GOT an old shaver that's loafing? Or a new one you'd like to see work even better? Feed it direct current and it will shed whiskers up to twice as fast.

Except for those with vibrator-type motors, shavers run on AC or DC. But they run peppier on DC, giving faster, cleaner shaves. This little unit-a oneevening project-supplies DC.

It also provides a voltage boost, so if you live where line voltage is low, it will bring your shaver nearer peak performance. The condenser filtering action

quiets much radio interference.

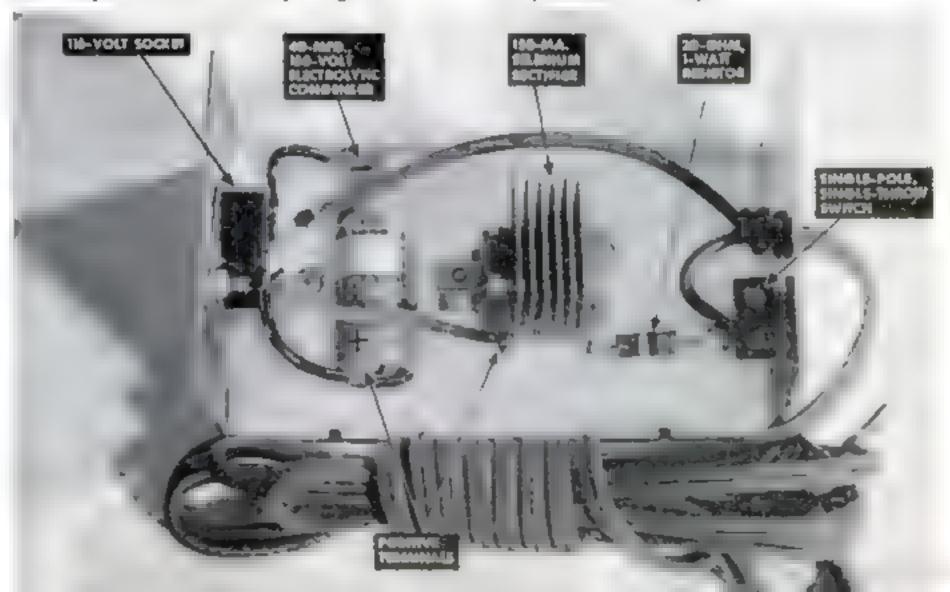
Any radio store has the parts. I made a unit with a 350-ma, selenium rectifier that no longer worked well in a TV set and a 40-mfd, condenser from a radio.

The base can be a board fitted with a cover or a U-shaped box bent from sheet metal. Mount the parts on this as shown in the photo below. Cover with a piece having flanges at right angles to the first. Connect the rectifier with its

LUXURY SHAVING is yours at home, too. This rig boosts voltage, converts house juice to direct current. This gives most shavers new pep, yields a closer shave in less time.

positive terminal on the same side of the socket as the plus side of the condenser. -Marion L. Rhodes, Knightstown, Ind.

EIGHT CONNECTIONS are all it takes, with parts in your junk box or from a radio shop. Wiring is so simple the outfit can be put together in an evening. But don't try to use it with a shaver having a vibrator instead of a motor. These are usually marked "AC only."



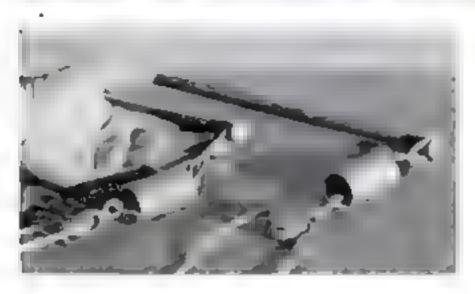
Drawer Under Dash Holds Glove-Compartment Overflow



THERE'S room under the dash for maps, sunglasses and the like if your glove compartment is always full of other items.

This composition-board drawer rides on wood runners mounted on the radio bracket and held to the dash with self-tapping screws. Assembly is chiefly with cellophane adhesive tape, which also seals the joints.

A slight pitch of the runner grooves toward the front of the car eliminates the need for a catch. The drawer face hides the runners from view and also serves as a stop.—
Tom Root, Plymouth, Ohio



Links Help Adjust Tent Rope

SPRINGS used to adjust tent or awning tension are easy to attach to metal stakes if you fit one end with links from an old chain, as at left. Use links that will go over the shank and be held by the head. Twisted wire can be used if you don't have a chain. Swivel pulleys at the other end of the springs are a convenience.—

Clinton R. Hull, Santa Ana, Calif.

▶▶▶A strong magnet in a cloth bag containing valuables will let you hide them in such unlikely spots as the underside of a sink. Don't include a watch; the magnet may ruin it.—Andrew Vena, Philadelphia.



Dado Head Doubles as Jigsaw

You can cut perfect circles or outside curves without a jigsaw or bandsaw, if you have a bench saw equipped with a dadohead attachment.

First, you trim the stock close to the line of the desired cut with a number of passes with the regular saw. Then saw to the scribed line with the dado head. The finished edge of the curve will ride on the side of the dado blade, which thus acts as a guide.—Vern Forsherg, Seattle.

Dowel Planter Gauges Depth

A SHORT dowel, hollowed at one end to keep a seed trapped, makes easy work of planting. Marked in inches, it gauges the depth you push seed into the soil. Set it in a length of broomstock for a handle.—David W. Denmer, Westerville, Ohio.





Candle-power portrait

What you can do with the new Tri-X film is dramatically illustrated by the portrait above. It was made by the light of three candles arranged to provide three-point lighting. The actual shooting setup is shown below. The camera was propped up on a book and hand-steadied, the picture taken at an aperture of £/3.5, at 1/10 sec.

New Photo Film Has Cat's Eyes

Shutterbugs can now click away with only the dimmest peep of light, using sensitive Tri-X.

By George H. Waitz Jr.

WELL, they have finally gone and made a camera film for the dubs. The real dubs, I mean—guys like me who snap the shutter at twilight and then blame the camera or film when they get only blanks.

The new film will forgive almost any photographic sin you can commit. It will take snapshots indoors about as easily





A REFRIGERATOR LIGHT provided the only illumination for this dramatic snapshot, made while the youngster was getting her before-bed snack. The camera was set at 1/3.5 and 1/25.



CANDID INDOOR SHOTS are no problem. This one, made in a New York department store on a dull snowy afternoon when there was little daylight, was shot at f/5.6 and 1/50.

as you have been accustomed to taking them outdoors. No flash bulbs. No photofloods, Just shoot.

Daylight coming in the window, or a table lamp or two, provide enough illumination for Kodak's new Tri-X, Snap the shutter. The film does the rest.

"That," remarked my wife, as I set up my camera one evening next to a table lamp, "will never work."

I wondered about it, too. The table lamp was one of those three-way affairs, with a top wattage of 150. I turned it up high. I loaded the camera with Tri-X and seated a friend in a chair next to the lamp. His cheek was 22 inches from the lamp shade. I set up my camera on a tripod three feet from my subject.

Now, get this: it was night. The only other light in the room came from a hanging lamp, also a three-way affair turned up to 150 watts, that was fully 10 feet away. It had a shade that cut its illumination in half

I cocked the shutter and began shooting. Keeping it at 1/10 second, I tried f/12, then f/22 and then f/8.

I had my film developed at the corner drugstore. It uses run-of-the-mill assembly-line developing and printing. I gave no special instructions other than that I wanted fine-grain development.

A day later I had the results, When I called for my pictures and opened the envelope, I got a pleasant shock. This couldn't be true. All three shots were acceptable—not good by professional standards, perhaps, but good enough for me.

Then I enlisted the help of PSM staff photographer Bill Morris, and, together, we really put Tri-X through its paces. With my lens wide open at f/3.5 and the shutter at 1/25, I shot a dozen daytime pictures of my youngster playing in her room. The only light was the daylight from two windows.

The pictures just about equalled anything I'd ever taken with flash. What's more, the daylight gave a soft and natural effect. There were no deep shadows and no strained expression on my 6%-year-old, who has become quite allergic to having flash bulbs popped off in her face.

From then on we shot just about anything, anywhere, to see what the film could do—daytime, night, indoors, outdoors.

We also tried Tri-X in a moderately priced box-type camera. Under fairly good light conditions indoors, the film yielded exceptional pictures.

For the shutterbug who likes to play





EVEN NEW YORK'S SUBWAY sat for its portrait when the photographer loaded up with Tri-X. Here, his camera set at f/3.5 and 1/25, he got a shut of the turnstiles at 42nd Street.

left, provided the only dlummation for this

"YOU CAN'T TAKE SNAPSHOTS IN HERE," said the NY. Central employee on the right. There's not enough light in Grand Central Station." He hadn't heard of Tri-X. Well, here it is.

snapshot made at 1/5.6 and 1/50. Film's wide latitude helps to counteract exposure errors.



around with portrait lighting, Tri-X has another advantage. Because of its speed, ordinary 150-watt mushroom-shaped reflector bulbs that you can buy for a dollar or so in your hardware store and that last for hundreds of hours can be used

for portrait illumination

With a 150-watt spot and two 150watt floods, which will cost you a total of \$3.30, you can obtain three-point lighting effects. What's more, because of the relatively low level of illumination. the highlights and shadows on the subject are easier to judge and balance, the subject is not subjected to the hot glare of conventional photo bulbs, and you don't have to worry about blowing a fuse because of excessive electrical load on your house wiring.

You don't need a tripod, either. In spite of the relatively low illumination, Tri-X will allow you to shoot at a speed (1/25 or faster) that makes hand-holding

your camera possible.

For baby pictures, indoors or out, the new film has the speed that has long been needed, just shoot. You don't have to worry about the subject moving.

The new film-available in 35 mm., 120 and 620—is rated at ASA 200 for daylight exposure (and that means the daylight coming through your windows when you shoot indoors). That's twice the recommended rating for the older

Super XX film, But experience shows that, if anything, the new film is considerably faster than that, Many professionals are setting their light meters at ASA 650, shooting their pictures accordingly, and then developing the film for from 13 to 15 minutes in D-76 developer held at 68° F.

In any case, the film has tremendously wide latitudes both in exposure and development, As a matter of fact, I found that if you rely on your eye to gauge the available light, the tendency is to overexpose rather than underexpose. You can overexpose the film as much as four or five times, however, and still get printable negatives.

Even in bright sunlight the film will provide usable negatives over a wide range of exposures. But an amateur who uses a simple box camera with a fixed exposure of f/11 and a fixed speed of 1/50 will probably play it safer if he switches back to Super XX or Plus X for his outdoor vacation snapshots. The recommended speed with Tri-X for light subjects in bright sunlight is f/22 at 1/100 sec.

Normally, in fast films that have been brought out in the past, any appreciable gain in film speed has meant an equal gain in the graininess of the negatives. In Tri-X, however, the extra graininess is almost negligible.





LOW-COST PORTRAIT LIGHTING is possible with the new fast film. Lights can be inexpensive, long-life 150-watt reflector bulbs. The portrait at left was made with a hand held camera set at f/8 and 1/50.



80X-CAMERA PORTRAIT. As shown above, the only illumination for this informal portrait was from two 150-watt bulbs balancing the window light Yet there was enough light to use a moderately priced box camera.



Light from two windows was enough to get this action picture at f 5.6 and 1 50. END



New for the Handy Man

1. Cutter Trims and Edges.

Turned on its side, this rotary clipper edges along walks and borders. Flop it on its face and it trims around trees and up against walls and fences (inset). A single nut locks the handle in either position. The blade is mounted on a shockabsorbing hub that gives against obstructions.

Further information about the products deretibed on this and the following page can be obtained from 2.1. Hersh Mfg. Co., P.O. Bas. 265. Garland, Tex., 2. Engineered in struments, Inc., 932. Soto St., Hayaned Catif., 5. Cubite Electric Products, Inc. 216 Datiolf St., Pracedence, R. 1., 4. terro American, Inc., 2008 Editor Ace., NYC 64, 5. American Screen Products Co., 807. N.D. 20th St. Miami, Fig., 6. Portable Electric Louis, Inc., 220 W. Bird St., Chicago 20, 7. (1911) Moto-Mover Co., Richmond Ind., Leenter) McGalloch Motors Carp., 6(6) W. Crotters Read., Law Angeless (right) RPM Mfg. Co., Lamar, Mo.





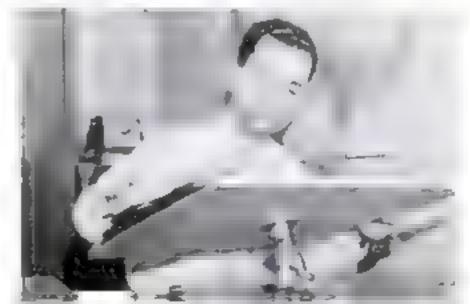
2. Garage Opener Lights Up. This remote radio control not only swings up your garage door as you approach, but it pops on a light, too. Mounted on the ceiling, it has a %-hp. electric motor that operates a drawbar on the door by a chain drive. You can open or close the door manually, overriding the mechanism at any time.

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3. Outlet is Shockproof. Children can't stick their fingers or playthings into this outlet plate. As you pull out a plug, a spring-loaded shield slides across behind the holes, sealing them shut. The plastic plate fits over any standard double outlet.



4. Drawing Stand Fits on a Desk. Screw a board to this aluminum stand and you have a drawing table that tilts or swivels to any position. Rubber-tipped tripod legs protect desk tops. The stand can be taken apart for easy carrying or storing.





5. Kits Build Screens Fast. You can make screens in a few minutes to fit any size windows you want with these kits. Aluminum frame pieces are first sawed to the lengths you need, using a miter box that's supplied with each set. Comer clips are shipped on to hold the pieces together (above)—no special tools are required. Glass-fiber screening is then stretched over the frame and held tight by hammering thin aluminum strips into grooves (at left), and the excess is trimmed off with a razor. Hardware for installing the rustproof, non-staming screens is also meluded.



7. Mowers Do New Tricks. Retractable wheels on the mower at left below lift out of the way so that you can trim up to borders without digging into soft soil or striking obstructions. Either front wheel can be moved independently, or both can be raised or lowered to adjust cutting height from 1" to 3". The twin cutters on the mower at center below have their own wheels set inside them to keep the blades at an exact height, preventing uneven moving or scalping. Storing the mower at right is easy with a new pivoted handle that lets you hang it flat against a wall



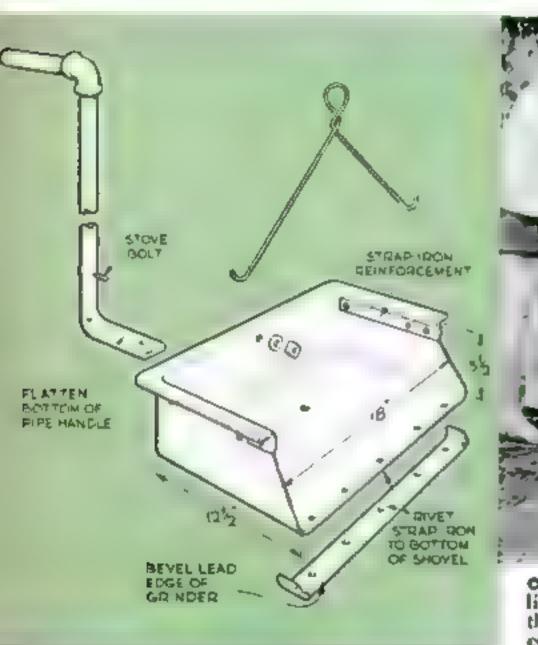


Building Attachments for a

Look in your scrap bin. Maybe you'll find most of the parts for these rugged garden tools.

By Barney Slawson

THESE sturdy garden-tractor attachments won't scrape the bottom of your pocketbook. Most of the parts are probably no farther away than your metal scrap bin-castoffs like half-inch pipe nipples, elbows and tees, a bicycle





OPERATING THE SHOVEL is fun. It is filled by lifting slightly on the shovel handle. This tilts the cutting edge into the ground—and up comes the dirt, with the greatest of ease."

Power Shovel

BEHIND a 2%-hp, tractor this power shovel does an impressive job of ditching and snow- and earth-moving. It will scoop up almost a cubic foot at a time, and it dumps its load almost automatically.

The main part of the shovel is a fivegallon stove-oil tank of the type used in many interior installations. Its onepiece back- and side-wall stamping is a natural for conversion, but a similar scoop could be formed from flat stock, bent and riveted to shape.

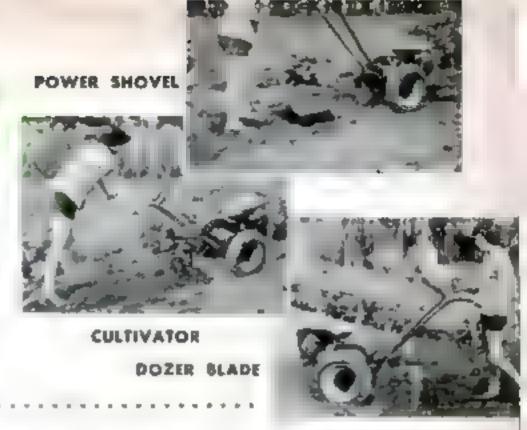
If you use a stove-oil tank, remove one of the long sides with a hacksaw. Make the cuts through the side walls on a slight diagonal, as shown in the drawing. Next, cut out the flat face of the tank, without removing the heavy flange that attaches it to the press-formed section.

Reinforce the lip of the shovel with

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Garden Tractor

fork and a five-gallon stove-oil tank. The only items bought for the shovel, cultivator and dozer blade shown at the right were a four-foot length of chain with swivel clips, a set of sweeps, a pair of strap hinges and a few bolts and rivets





TO HAUL THE LOAD AWAY, the handle of the tractor is simply lifted, raising the plow beam and the attached voke. This oil-tank shovel holds almost a cubic foot of earth

OP AND OVER goes the shovel when the tractor handle is pressed down, damping the dirt where it's wanted. With room to turn the tractor, it loads and unloads on the fly.

an 18" length of strap iron whose cutting edge has been beveled on a grinder, or with a file. Attach it with \$" rivets. Use similar strap-iron sections to reinforce the shovel sides where the tongue of the shovel passes through them

Shape the tongue from a 3' length of %' rod. Twist a large loop at its center so it can be fastened to the tractor's plow beam with a half-twist clevis.

For the handle use a 27" piece of %" water pipe. Hammer the lower half-foot flat and angle it over to fit under the

shovel. Rivet it in place and drill a hole through the pipe and the back of the shovel just below the flange to take a short stove bolt. Attach an elbow to the upright pipe and thread a 6" pipe nipple to the other end for use as a handgrip.

The three simple operations used to fill, transport and dump the shovel are shown in the photos above. Unless you are using the scoop as a snowplow, leave the colter on the plow beam, to stabilize the load.

Cultivator

WITH an old bicycle fork, some strap iron and a few pipe fittings, you can be breaking ground with this sturdy cultivator a few hours after you start construction.

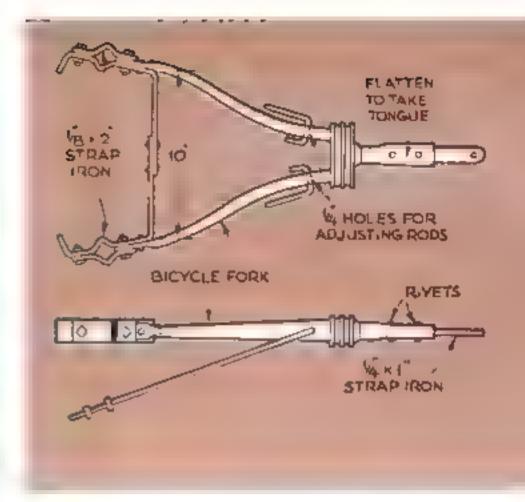
Begin by cutting a 12" tongue from X"by-1" strap iron. Then flatten the upper end of the bicycle fork's handle-bar tube. When the tongue will just fit into the resulting sleeve, drive it a few inches into the tube and secure it with rivets.

Mark the location for the kingpin hole on the tongue. With the hole drilled and the pin in place, the fork should engage the frame plate on the tractor when it is held horizontally. If it does not, bend the tongue to make the necessary ad-

justment.

Uncouple the tongue again and clamp one leg of the fork in a vise, putting the bite about I" below the fork arch. Bend the leg outward by pulling on the handle-bar tube and tongue. Bend the other leg until the two ends of the symmetrically curved members are 10" apart.

From W'-by-2" strap iron cut two 14" lengths and two 3" lengths. Clamp the 14" pieces together and, starting %" from one end, drill four K" holes through them at %" centers. These holes will be used



to adjust the width of the cultivator.

Now, separate the strips and bend them to the contours shown in the upper drawing above. Bend the 3" strips to form the outer sections of the clamps that will grip the sweep holders.

To assemble the frame, bolt the two long sections of strap iron together through holes that give them a spread of 10". Spring the ends of the fork over them and line up the axle holes (or slots) of the fork with the forward clamp holes. Position the short clamp sections and bolt all of the pieces together. Then drill

Dozer Blade

HANDY for leveling rough spots in gardens and lawns, and back-filling small trenches, this dozer blade can be made in an hour.

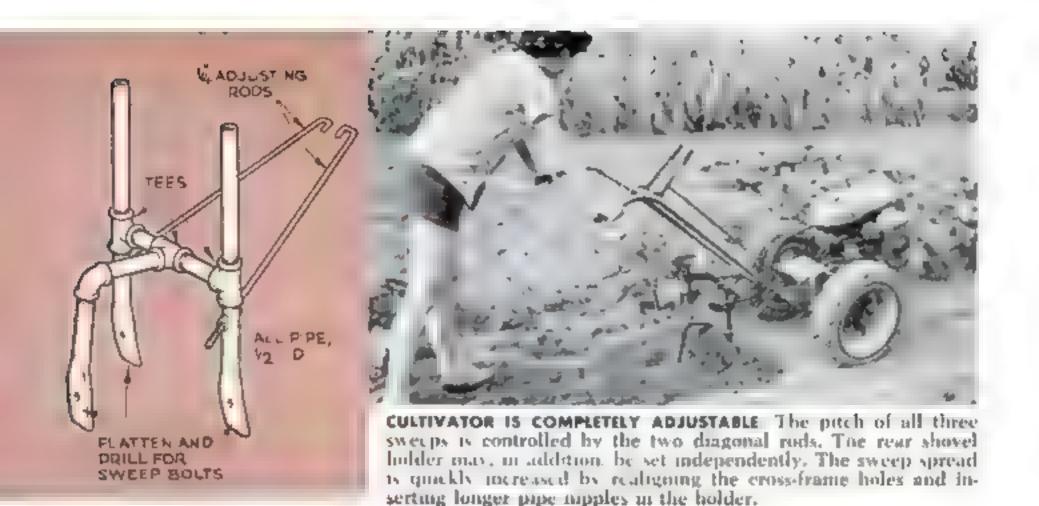
Use a 30" length of two-by-eight for the blade. Cut a slightly angled recess along its leading edge to take a length of strap iron 1%" wide. Bevel the bottom edge of the strap iron and drill and countersink holes for the flathead screws that attach it to the wood.

Two 6" strap hinges form a hanger to suspend the blade from the tractor's

plow beam. Fasten the hinges to the top of the blade, back to back and the width of the plow beam apart. Bore aligning holes in the free ends of the hinges for a x" bolt which completes the hanger assembly. Finally, drill a hole near each end of the blade just above the strap iron and insert eyebolts.

To adjust the blade to the cross-angle and pitch needed for any particular dozing job, use a 4' length of chain with a clip at each end. Wrap the center of the chain around the clamp that holds the colter to the plow beam. When the right amount of linkage has been taken up on both sides of the clamp, attach the clips to the eyebolts.

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another pair of holes through the fork sides and the long strap sections just ahead of the clamps. Belts passed through these holes will hold the fork and strap-iron parts in rigid alignment.

The sweep holder is a simple, H-shaped assembly of "piping and tees, with a third tee cut into the center of the cross member to support a trailing shovel holder made from two pipe nipples and an elbow. Flatten the lower ends of the vertical pipe sections and drill holes in them for the sweep bolts

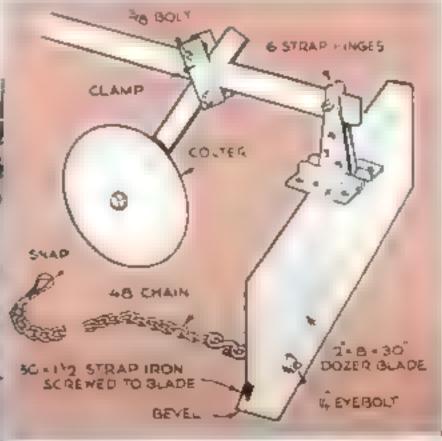
Two lengths of drill rod control the

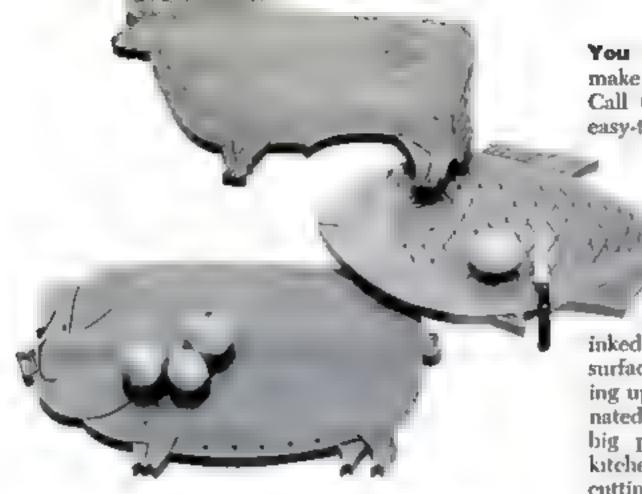
pitch of the sweeps. These are passed through holes drilled through the outer sweep holders just below the tees, then angled over and sprung through holes in the legs of the fork, about an inch behind the fork arch. Cleat the forward ends of the rods to hold them in place, and thread the sections of the rods that project behind the sweep holders to take adjusting puts.

With the shovels adjusted to a depth that lets them clear the ground when the tractor handles are raised, your cultivator is ready to roll

REAR-MOUNTED DOZER BLADE wipes out tractor tracks and makes control easy. See how the weight of the load pulls the wheels into the ground to give them maximum traction







What's New in Patterns

Furniture by Top Designers. Want to build your own modern furniture? You can use plans created by six of the country's leading designers-among them Russell Wright, whose drop-leaf table cart you see at right. Designers of other pieces are Peter Hunt, a decorated chest; Freda Diamond, a drop-leaf coffee table: George Nelson, a storage wall; William Pahlmann, a room divider; and Edward Wormley, a screen-bar, Sponsored by U.S. Plywood Corp., plans and instructions are available at lumberyards and power-tool stores,



You iron On the Patterns. To make woodworking easier, the Mc-Call Corporation has adapted the easy-transfer feature of its dress

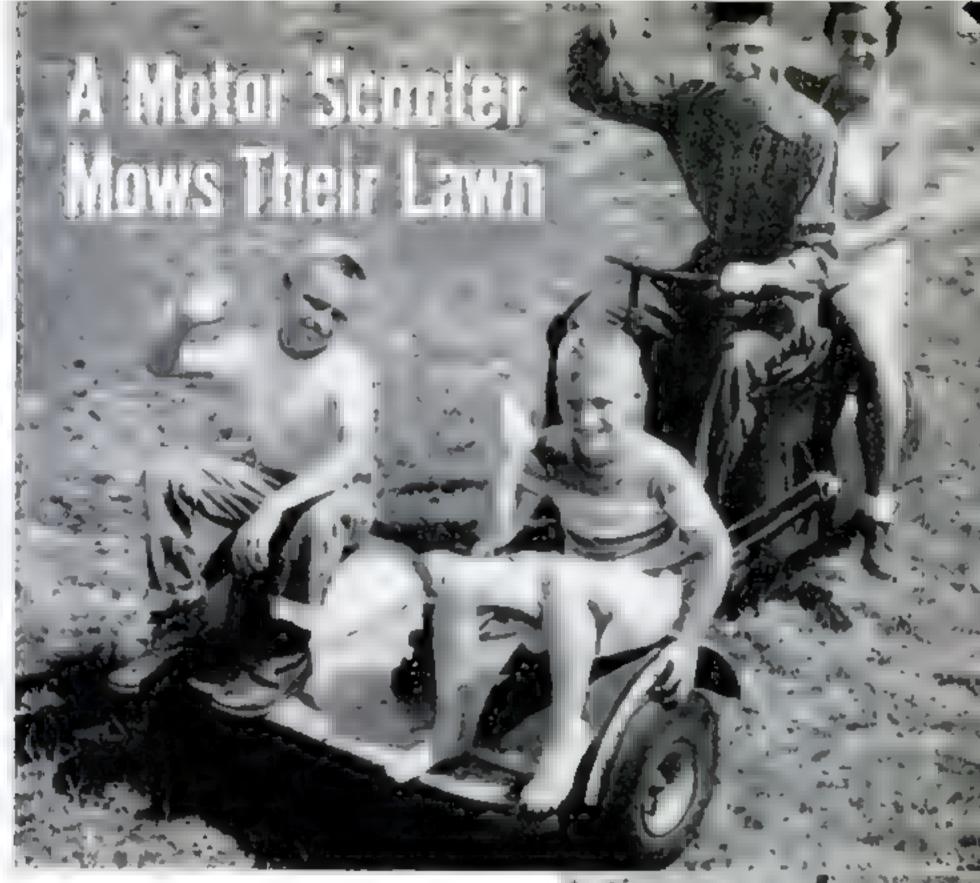
patterns for use on wood in the home workshop. A medium hot iron is run over a full-size pattern placed on the wood. This leaves an easy-to-follow

inked outline of the pattern on the surface. The usual tracing or scaling up from squares are both eliminated. Projects available range from big pieces of furniture to small kitchen aids such as the decorative cutting boards shown here. The patterns are available from Mc-Call's Patterns, 230 Park Ave., New York, and many stores throughout the United States.



Patterns for Decorations. Homeowners who have plywood interior walls can use new full-size patterns to rout pictures right into the wall surface. The decorations can also be applied to doors (left), furniture, screens, wall plaques, built-ins and other furnishings. The patterns are traced directly on the surface. You then etch out the design with an electric routing tool. Patterns and instructions are supplied by the Easi-Bild Pattern Co., Pleasantville, N. Y. Both modern and traditional designs are available.

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It covers the ground at a fast clip—and never lacks for volunteer drivers.

WITH his three acres of submarginal will grass lawn taking regular toll of his power mover. Bill Triball built a tangliet one from an airport motor schoter. At 10 m.p.h. it takes two hours to do a job that took the conventional model all day. It's simple chough to be run by his wife or sons.

A Pan American industrial engineer at Miami, Bill bought an old three-wheel scooter for \$71. For roughly \$20 more he obtained from hardware and auto-parts stores, machine shops and junk yards the necessary parts for converting

He replaced the delivery body with a sheet of boiler plate, and mounted two pillow blocks in the center for a bearing. On the bottom he hung a cutting blade made from the sharpened leaf of an auto spring, and connected its shaft by pulleys and V belts to the drive shaft which he extended from under the seat. Then he added a pulley and a shaft clutch

Inn Martenhoff, Kendall, Fla

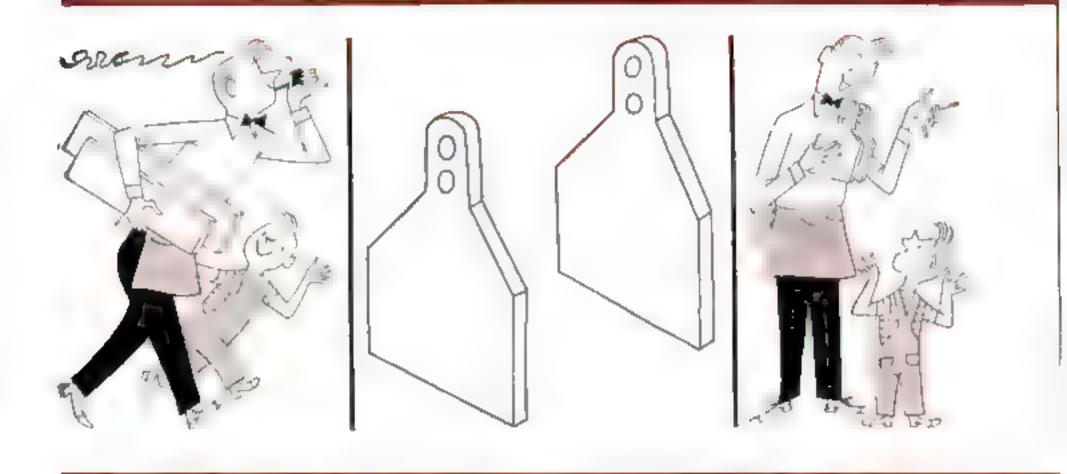


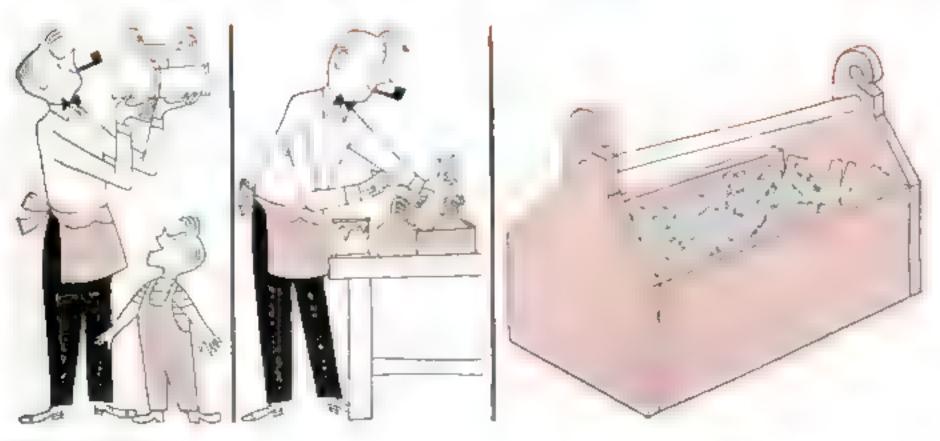
shalt clutch (top that disengages drive to blade Guards over this and the forward belt are a needed safety measure. Business end of the mower is 30" cutting blade chelow made from old auto-spring leaf.



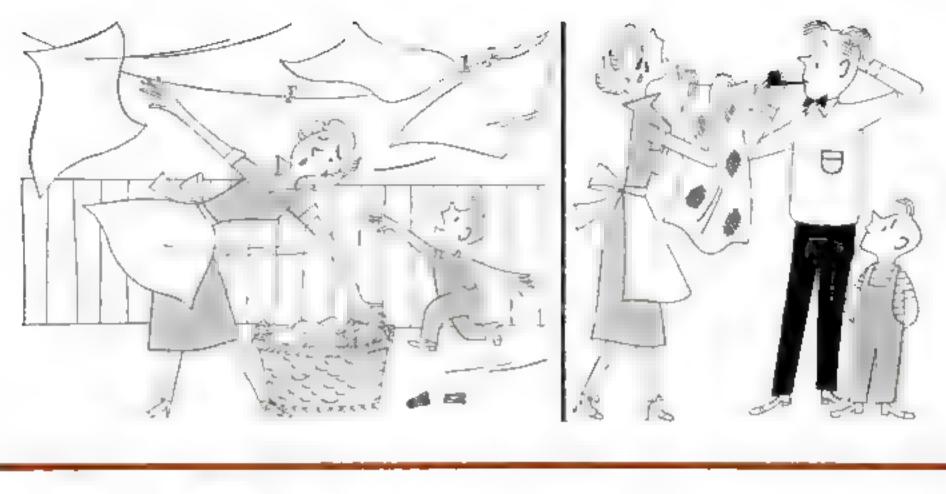
Workshop

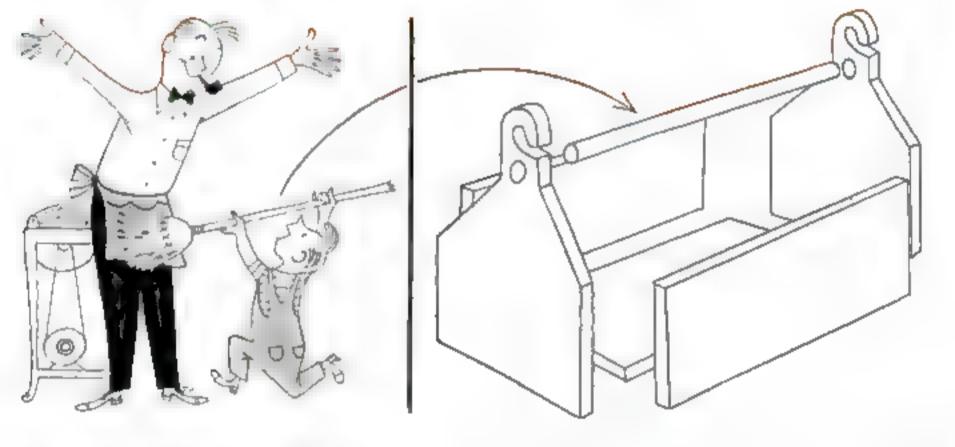


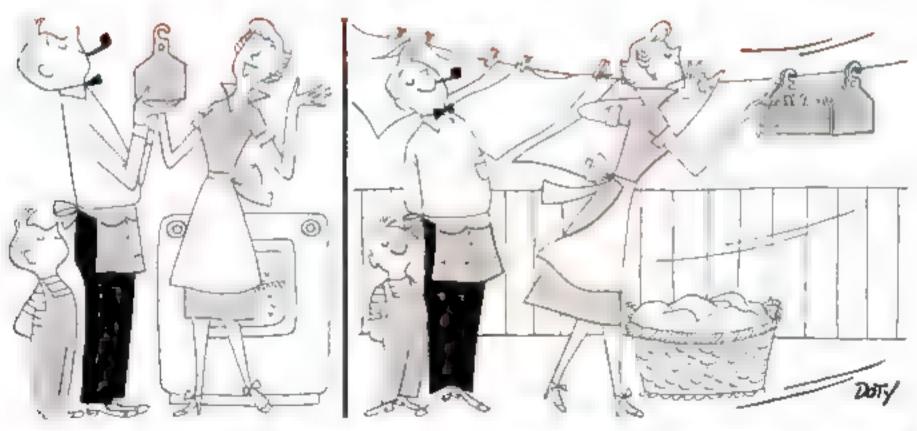




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Next Month: A tip-proof holder to safeguard flowerpots MAY 1955 217

Want to hunt uranium? The Atomic Energy Commission developed the circuit for this new

Super Geiger Counter

By Howard G. McEntee

URANIUM is the magic word that has already put more than one amateur prospector into a high tax bracket. But to find radioactive treasure, you need a good radiation counter.

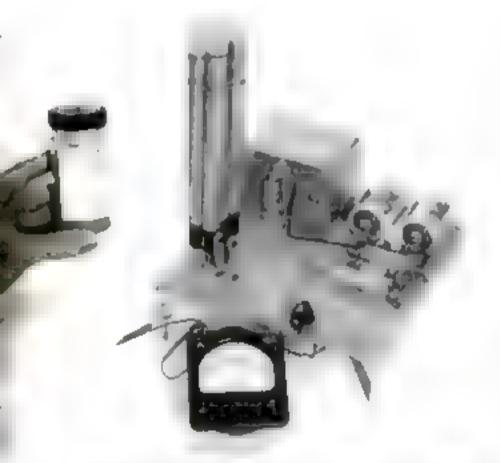
Really hot counters start with price tags of a few hundred dollars. Not having struck it rich yet, I wondered if I could build one myself. To find out, I went to the U.S. Atomic Energy Commission's Health and Safety Laboratory at the New York Operations Office.

Tube nets one percent. Any single Geiger tube, the experts told me, is only about 1% efficient—99% of the gamma rays go through it. To make up for this, In-

struments Branch Chief Harris Le Vine has worked out a neat trick—using six Geiger tubes in parallel, which snare roughly 6% of the rays. I was assured the original breadboard rig could be made up as a field instrument.

Furthermore, the six tubes would give calibrated readings, enabling the user to assay his find. Properly built, I was told, the six-tube instrument would approach the sensitivity of at least the lower-priced (\$300-\$400) scintillation counters. However, you can build the outfit with only two Geiger tubes, and add more later.

Meter averages counts. Each gamma ray triggers a Geiger tube so that it momentarily conducts current, causing a click in earphones or a flicker on a



HERE'S THE ASC JOB. This original breadboard layout, built by the AEC's Health and Safety Laboratory, has six Geiger tubes tied into a bundle which was held with rubber bands. Since 99% of the gamma rays go right through any one tube, the inside tube still gets a crack at them. Although entirely different in layout, the self-contained field instrument shown at the right closely duplicates the performance of the laboratory setup.

readings indicating .3, .1 or .03 milliroentgens per hour. Meter is always set to .2 ma. before testing a sample. In the .3 range, the .5% uranium sample reads about .28 ma. The 1%, 2% and 4% samples read .38, .55 and 1.0 ma. On the .1 range, readings are .37, .6, .35 and .52 ma., the last two with sample 3" from bottom of the case. Do not cut a hole in this; the gamma rays will readily pass through.

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meter. Trouble is, phone clicks are hard to count, while a meter may swing so fast over a "hot" find that you can't read it. If you "damp" the meter—slow down its response—single counts may be so far apart that you don't get a true reading.

But with several tubes ganged, counts follow each other so closely that a damped meter quickly reaches a true value. The needle averages up the

meter. Trouble is, phone clicks are hard counts. Therefore Mr. Le Vine calls this to count, while a meter may swing so multiple-tube rig a Geiger Integrator.

Redesigned for field use, the unit I built cost about \$180 for parts. A kit is now available for somewhat less.*

Batteries are cheap. All Geiger outfits require high voltage. In this instrument it is provided by two flashlight cells working a compact vibrator unit. The

*Federated Purchaser, 66 Dev St., M.L.

cells should last about 100 hours; new ones cost 30 cents.

There are three other batteries, of the mercury type, which cost under \$5 in all. Two have about the same life; the third (B4) will last up to 400 hours.

Meter versus phones. If you prefer, you can hook a pair of high-impedance phones across resistor R14 (it may help to short out the meter and disconnect the

damping condenser C12).

But with a meter the instrument can be calibrated. The switch positions give three sensitivity ranges, calibrated in milliroentgens per hour. These .3, .1 and .03 mr/hr. values apply when the meter needle goes from its preset base of .2 ma. to full scale, or 1.0 ma.

Seal against moisture. Since highvoltage equipment is vulnerable to dampness, I built it into a seamless case with a well-fitting cover. Be sure to:

• Fit the cover with a rubber gasket. I used "sponge rubber, held with heavy-

duty rubber cement.

• Use a rubber washer under the head of every screw that goes through case or cover; mine are 1/32" firm rubber.

 Put gaskets of the same material under both ends of the handle.

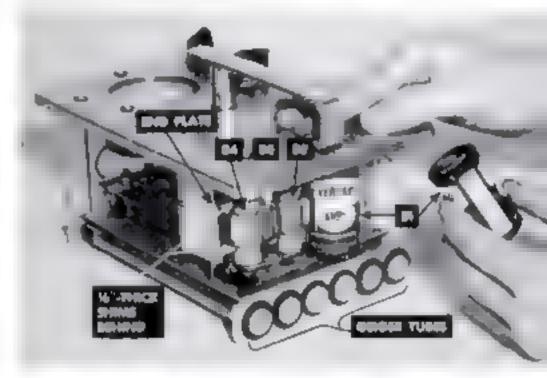
Moistureproof the controls as shown.

• Seal the meter peep-hole with a sheet of acetate cemented to the underside of the cover. The meter-mount screws pass through the plastic and help hold it. Spacing washers enable the zero-set screw to clear the plastic.

Shape parts from aluminum. Use 1/16" sheet aluminum for the subpanel

All equipment is mounted on lid of seamless aluminum case

MOUNT THREADED BLOCKS in the case with screws and rubber washers. Drill bolt holes in the cover; then mark through them to spot the matching ones to be tapped in the blocks. Spot battery holders on end plate and drill for 2-56 bolts, which hold power case on the other side. Wire so that all batteries go in positive end up, check polarity of the mercury batteries by the markings on their cases.



and end bracket. The former holds the Geiger tubes; the bracket is used to attach the subpanel to the cover at one end, and to mount the power-supply and battery cases.

The holes for the Geiger tubes and their sockets are best made with chassis punches; it is difficult to make clean holes of this size with an ordinary twist drill. Another method is to drill a circle of small holes around, chisel through between them, and file smooth.

At one end the Geiger tubes fit into three-prong sockets; at the other they lie in rubber grommets (you may have

PARTS LIST

V1: Roytheon CK1036 V2: Roythean CK1037 V3-V8: Anton 310 (Anton Electronics Lob., 1220 Flushing Ave., Brooklyn, N Y. VP, V10: Raythuen CX5886 3-prong Subminiature sockets, rings (Cinch 2H5) 3-prong sockets, rings (Amphenol 74-335) Vibrotran E1017 (Edko Electronics, 202 Grand St., Bencklyn 11, N. Y SW1-SW4: 4-pole, 5-position rotory switch (Centrolob) O-1 mp. 3" round meter (Triplett 321T)

electrolytic (C-D BBE)
C2: .001-mfd , 600-v disk
cacomic (CRL-DD(02)
C3: 05-mfd , 1,600-v
(Maltery Ploscop PTI615)
C4-C9: 47 mmfd ceromic
(CRL D6-670)
C10: 25 mfd , 200-v, paper
Arravax P-282
C11 1 mfd 200-v, paper
Arravax P-282
R1: 18-ohm ½-watt carbon
R2: 10-meg ½-watt carbon
R3:R8: 47:000-ohm, ½-watt
R9: 3:9-meg ½-watt, 5%
R10: 11-meg, ½-watt, 5%
R10: 11-meg, ½-watt, 5%

C1, C12: 100-mfd, 6-v.

213 3,000-ohm variable reninter (IRC Q11-112) N14. 1,500-ohm, 1/2-watt I Battery case (Acme No. 12) 1 Baltery case (Acme No. 15): 6 Rubber grommets, 1/4" hole 2 Small bor knobs 41/4"-6"-9" seomless aluminum case and cover (Zero Mig. Co , Burbank, Calif) 1 1/4"-2 9/16"-4 1/4" seamless case and cover (Zero) 2 Teflon standoff terminals (Seplectre ST-1000) 3 Teflon feed-through terminals (Sealectro FT-1000) M1. 2 "D" Hashinght cells

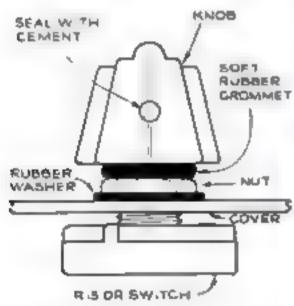
R12: 16-meg. 1/j-watt, 5%

#2, #4: 9 4-v mercury batteries (Mollery 302437)
#3: 1.4-v IMallery RM502R)
Misc aluminum or durol,
1/16" sheet, ½-½" bar,
½" rod; penel decals,
6-32 screws; ½" o.d
bushings; lugs; wire; rubber for gashets, washers,
3½"-eq clear 1/32" acetale; 1/16" linen Bakefile
Counter calibration somples,
\$10 postpate (AEC, Box
150, New Brunswick, N J.)
Trocerlab R-20 radium button (\$3.50; Trocerlab,
Inc., 130 High \$t., Boston 10)

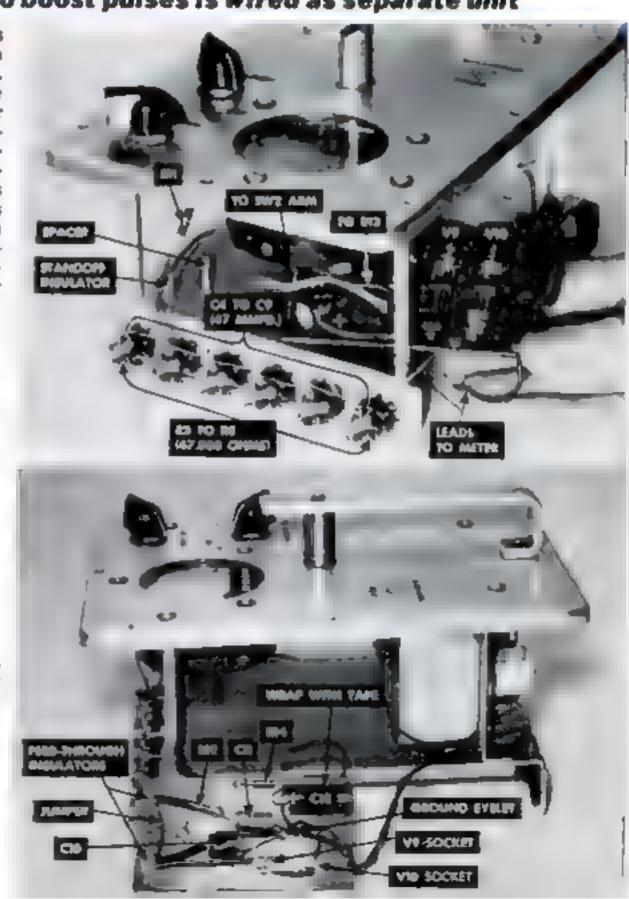


Two-tube amplifier to boost pulses is wired as separate unit

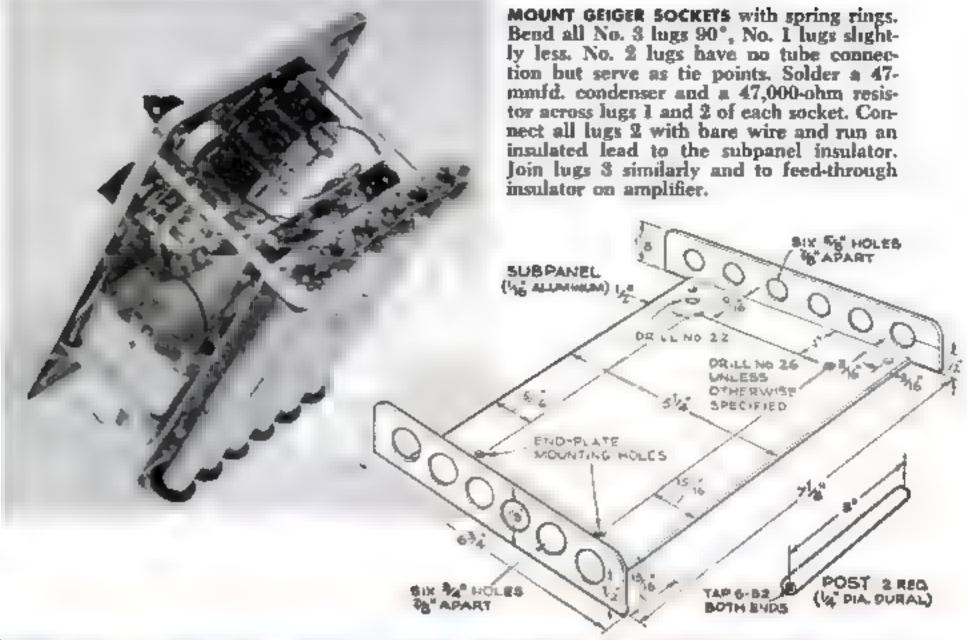
for mounting the meter from the template provided with it. The big opening can be made with a fly cutter, hole saw or jeweler's saw. Compact amplifier is wired up on its own chartis and mounted on the subpanel by means of two bolts and ¼" o.d. bushings. Tubes are secured by an aluminum strap bracket (not shown) padded with sponge rubber beneath. This strap is held under the chassis mounting screw.



MOISTUREPROOF the controls by clamping a rubber washer under each hex nut and a soft rubber grommet below each knob. Lubricate with glycerin. Right, amplifier from beneath.



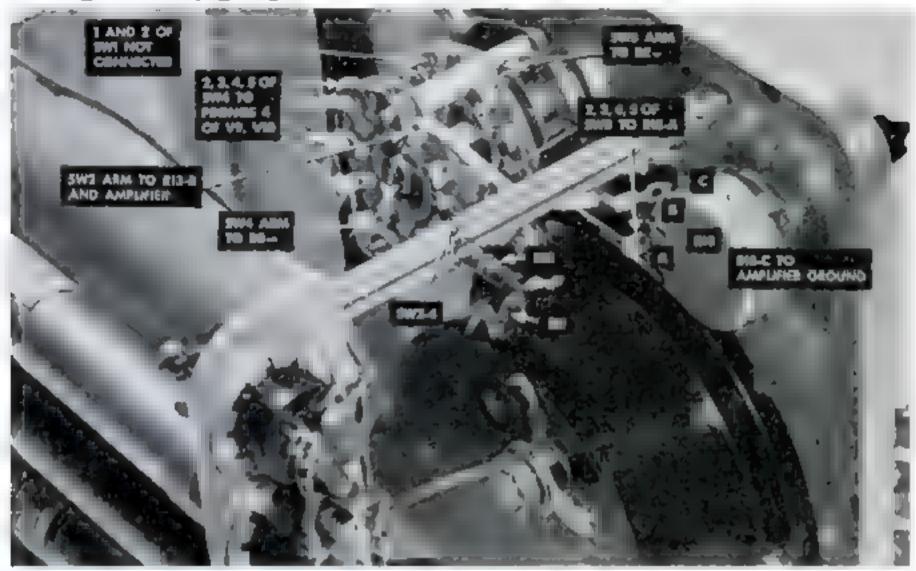
Geiger tubes fit into a subpanel fastened to the cover



Wiring is not too complex, but run all of the high-voltage leads



A single rotary gang switch handles four circuits



CLOSE-UP OF SWITCH shows some of its connections. Arm lugs (represented in diagram by arrows) are first ones clockwise, as seen from

rear, of the studs that hold switch together. Lugs 5, 4, 3, 2 and 1 follow clockwise in that order. Geiger-tube socket can be seen at left.

with care to prevent leakage



to enlarge the hole in these). The grommets should touch only the plastic tube ends, not the shells, which are at high voltage. Bend the flanged subpanel ends exactly 7%" apart inside; if it's shorter, the shells may touch the grommets.

Cut the clips of the small battery case shorter and reshape them to grip the mercury batteries. To center these on the contacts, mount %" composition shims behind with 2-56 case nuts.

High voltage in a box. The power supply is built onto the cover of its case, which has a piece of sponge rubber cemented inside it to press against the tubes.

The vibrator-transformer is held with three long screws. Two small angle brackets attached to the transformer hold one end of the Bakelite chassis; a %"-long bushing supports the other.

Two chassis eyelets provide soldering points to which several components can be tied. Attach one end of C3 to the standoff insulator, which will take the strain of this off the socket lug.

The Teflon insulators are pressed in-

to No. 22 holes. All leads in heavy lines on the diagram are at high potential and should be kept away from chassis metal. A lug on the cover provides a ground connection; do not depend on metal contact to provide a common ground, but run ground wires between units.

Only two leads of V1 and V2 are used. Clip the third short as in the drawing and pull out all but the two end socket lugs. Be sure to cement the sponge-rubber pad where it will touch the glass, not the tube leads, to avoid leakage.

Using fewer tubes. Even with only two Geiger tubes, you will have an instrument as good as many commercial ones. To retain the same calibration, resistors R9 to R12 should be three times the listed value. Full-scale readings will then still indicate .3, .1 and .03 mr/hr., but of course the instrument will not be as sensitive.

Caution—hot juice! The little power pack really puts out high voltage, so before touching the Geiger tubes or other

"hot" parts, always discharge the filter condenser by shorting the power-case insulator to the chassis.

Testing the outfit. Install batteries B3, B2 and B4, switch to "Test," and see if you can make the meter read .2 ma. by turning R13. (It will jump momentarily as you switch on, but should soon drop back.)

Now insert the B1 cells and switch to .8 setting. The meter should still read about .2 ma, If it goes higher (with no radioactivity near) there may be leakage at the Geiger sockets. Check by removing all Geiger tubes; on all three range settings you should get about the same .2 ma, reading as at "Test."

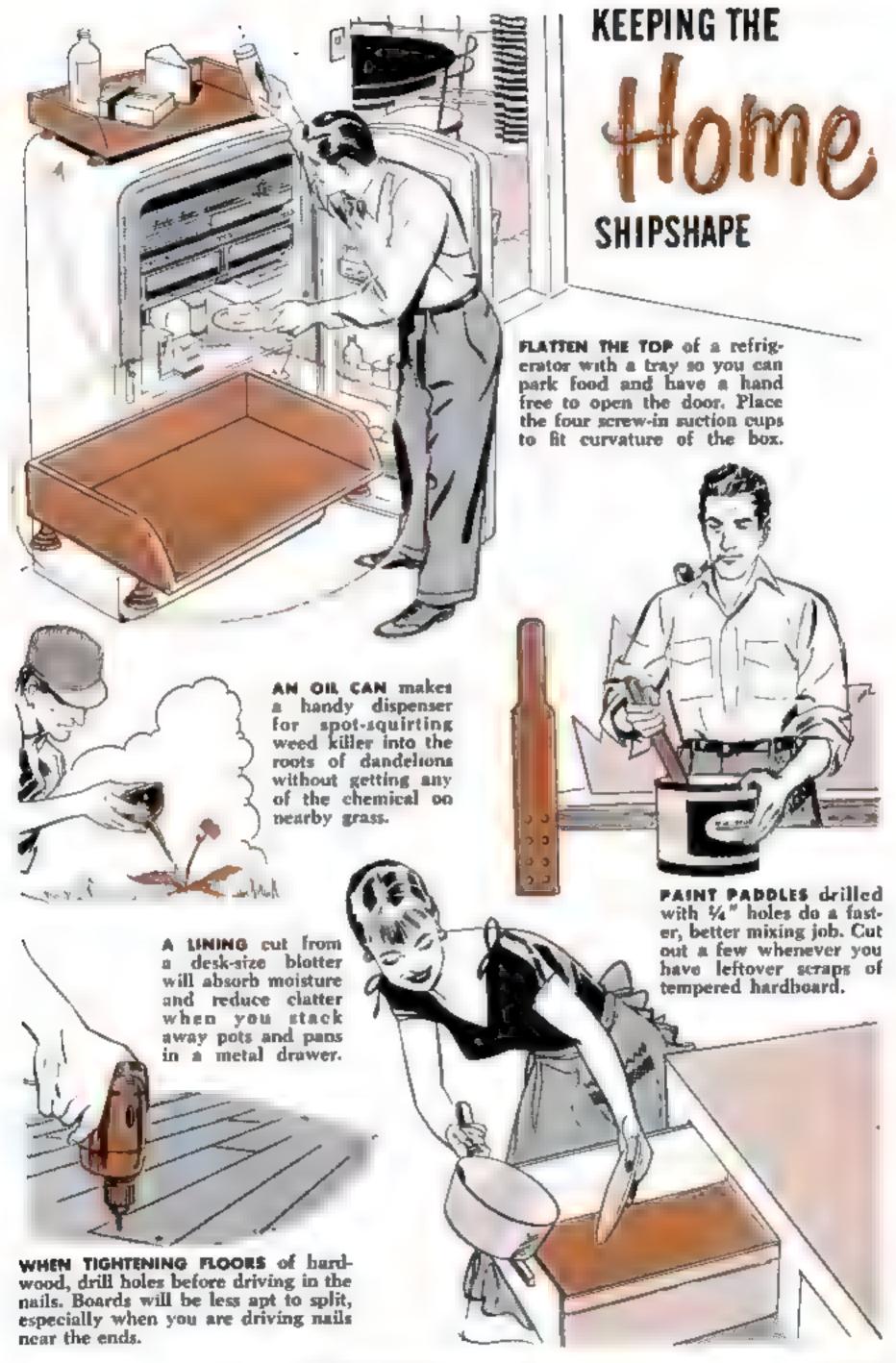
With tubes in, a slightly higher reading is normal on the two upper ranges, due to "background count" from cosmic rays and other sources. The AEC set of four bottles of uranium ore is valuable for checking. Although not calibrated, the radioactive button listed is handy for field testing.

Midget vibrator, two tiny tubes supply high-voltage direct current





HIGH-VOLTAGE SUPPLY has two tubes, mounted in miniature sockets. Sponge subber in case bears against glass-tube envelopes. One end of C2 goes to the "hot" vibrator contact (with red wire on it). Yellow lead and one end of R1 go to ground lug under transformer-core bolt.



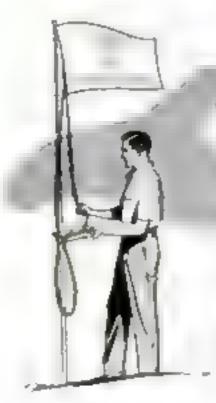




A BLOB OF PUTTY stuck to ladder or window sill will hold glazier's points, making them easy to grasp, hard to spill.



string a line between two picture hooks and a youngster can hang up a raft of drawings without marring the walls. Snap clothespure hang the art work on the line

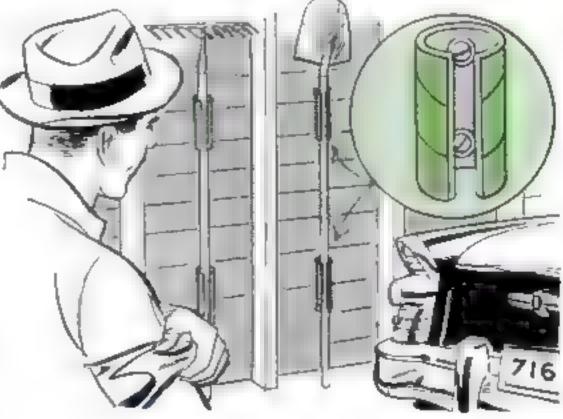


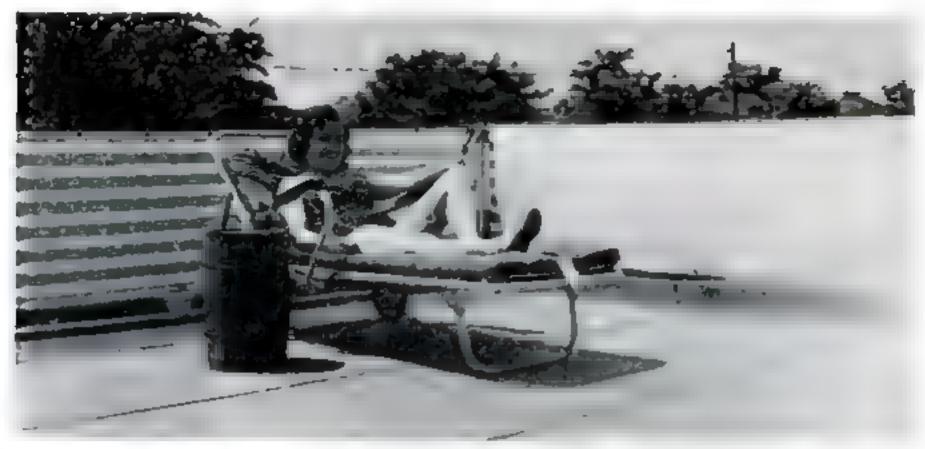
A FLAGPOLE ROPE will last through a good many more ups and downs if you wipe it well with a rag soaked with inseed oil before stringing it. If rope's already on the pole, draw it through oil poured into a pan.

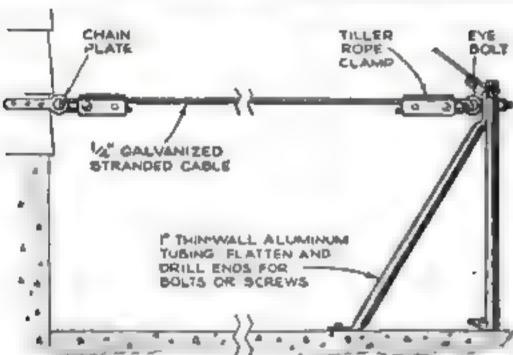


PAINTING TRIM on a brick house? Keep a broken brick handy. When rubbed over spatters on masonry, the brick dust picks up paint. A chunk of concrete will do the same job on spattered concrete.









Railing Like Boat Deck's Encloses Your Sun Deck

LENCTHS of 32" weather-treated canvas lashed to a railing made of boat hardware will convert a flat roof or terrace into a sun deck with plenty of privacy.

Fittings you need are metal tubing for corner stanchious, steel cable, clamps, eyebolts and chain plates. Punch brass grommets into seams at the edges of the canvas and lace it in place.—Elbert Robberson, Port Washington, N. Y.

Jigsawed Wooden Grille Personalizes Screen-Door Decoration

Eastly cut from hardwood, a scroll or geometric grille adds interest to a screen door.

It will also protect your screen from children's pushes. Dowel or toenail the grille to the stiles at the height of the children's hands.

The patterns suggested were de-

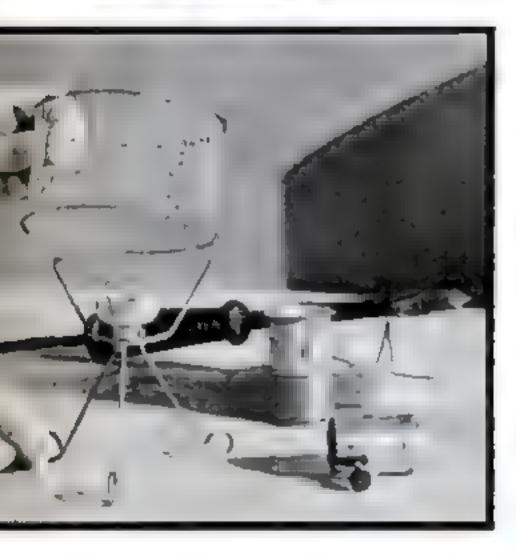
signed for a door with a 24" opening between the stiles. They can be adapted to any suitable length by changing the size of the squares on which they are laid out.

An initial incorporated in the design gives it a personal touch. I used a "V" for mine. —John G. Voelker, Towson, Md.





Three Decorative Lamps for Your Home

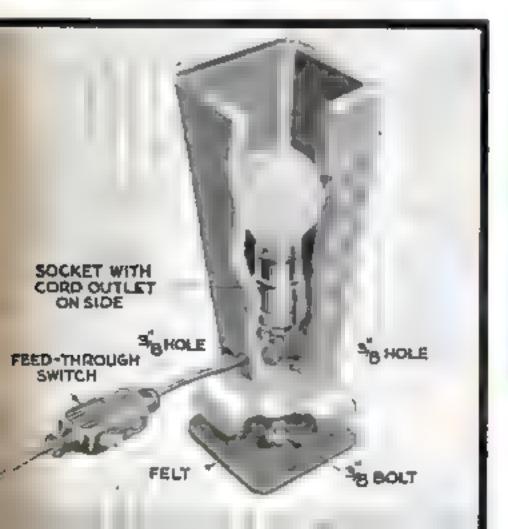


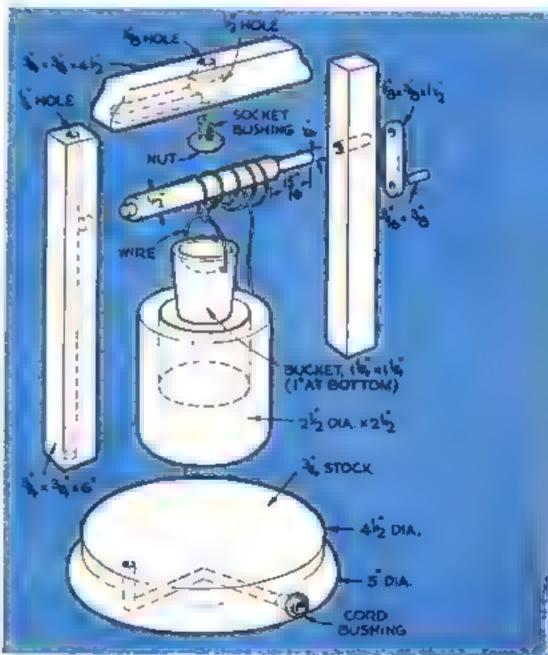
Coat-hanger wire and quarter-inch hail screening form the "wrought ironwork" for this attractive modern lamp. First, solder a lamp socket to a washer. Then remove the paint from several straightened coat hangers with sandpaper. Cut and bend the three legs and solder them securely to the washer

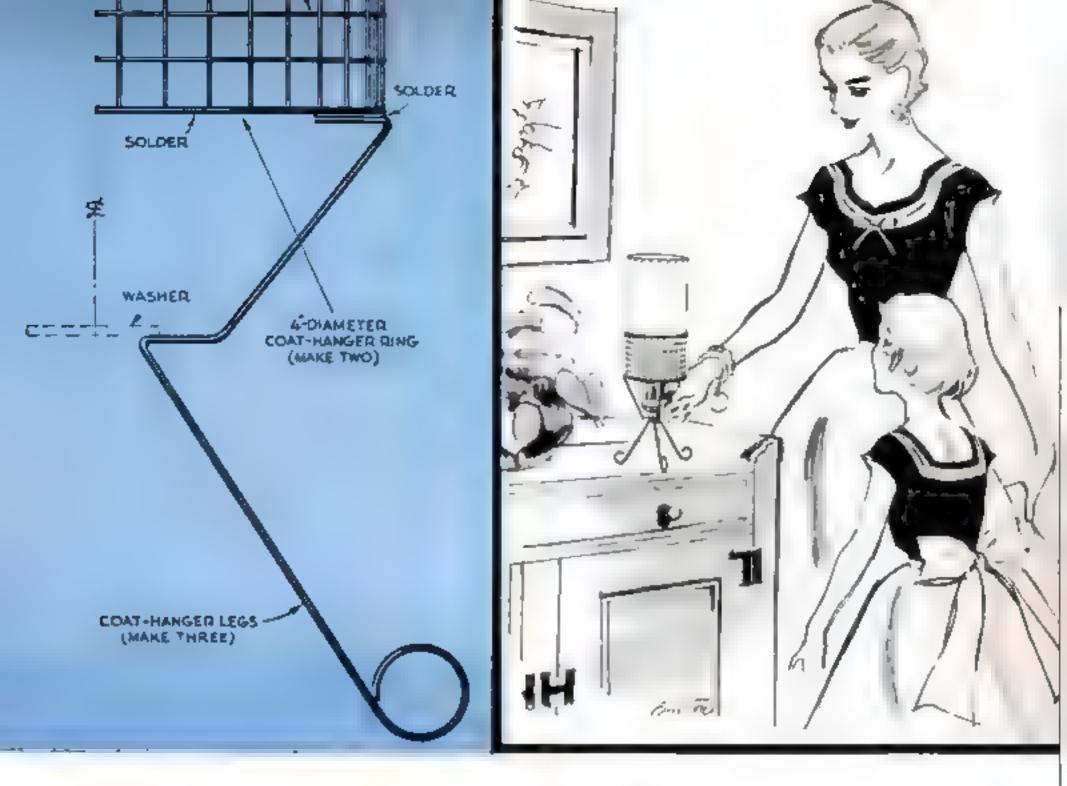
Make two 4"-diameter rings, filing slots where the ends of the wire meet, and floating in solder for strong joints. Cut a 2%"-wide strip of hail screening, bend it into a cylinder, and solder the ends of the cylinder to the inner surfaces of the rings. Position the resulting shade cage on the tops of the three legs and solder the legs to the ring at 120° intervals.

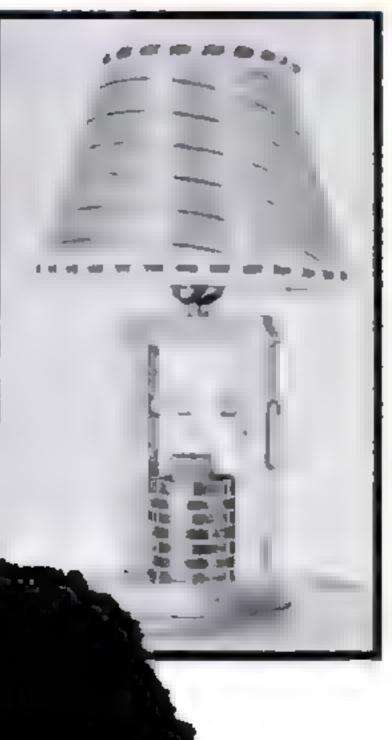
Scrub with detergent to remove soldering paste; then apply flat black paint. Set a 2%" cylindrical shade in the wire-mesh cage. —Clifton Morris, Lubbock, Tex.

2 A porcelain vase makes a restful TV viewing lamp. Drill one %" hole through the bottom of the vase and another through one of its sides, using kerosene on the bit to ease it into the porcelain. Pass a %" bolt through the hole in the base from below and thread it into the back of a light socket. Use the other hole as an outlet for a lamp cord with a feed-through switch cut into it at a point several inches from the vase.—J. T. Whitaker, Mahanoy City, Pa.





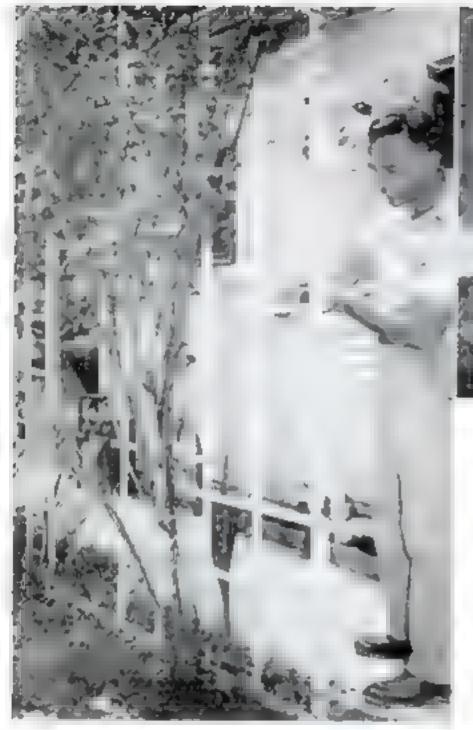




3 A wood-turning lathe with a faceplate will help you give this "old-oaken-bucket" lamp a whirk. Turn the base, well-body and bucket from maple or beech, and the windlass from \$" doweling. Make the windlass frame from \$"-square strips of the same wood. Drill a hole in the center of the cross member for a light-socket bushing and nut; then carve a groove in its undersurface to carry the lamp cord to one of the uprights. Drill a \$" hole through the upright and the section of the base beneath it. A quarter of the base circumference away, drill a \$" hole into the edge of the wood for another cord bushing. Connect the two holes with an L-shaped channel carved or routed in the underside of the base.

Before bradding and gluing the parts together, attach the lamp socket and thread the cord through the holes and channels. Also insert the windlass in the bearing holes before attaching the upright on the crank-handle side. Make the crank from a thin strip of wood and the handle from doweling. Drill holes in the bucket for a wire bail and tie a piece of cord a foot or more in length to the bail for a bucket rope.

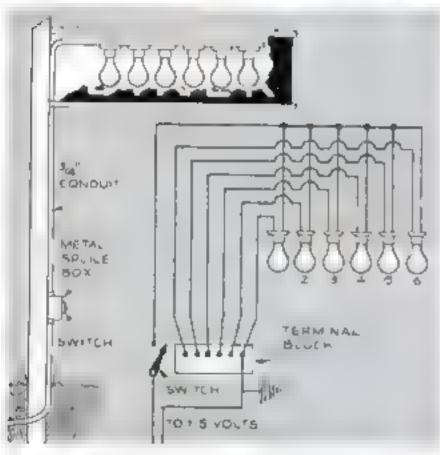
Give all wood parts but the well-body a natural finish (two coats of shellac or varnish). Paint the well-body brick-red and apply gray mortar stripes with a brush or striping tool. Finally, wind the bucket rope around the windlass and, with bucket at height indicated, secure it with several drops of cement.—Herbert Y. Moon, Orient, N. Y.





Coat-Hanger Hook Tames Rose Thorns for Tying

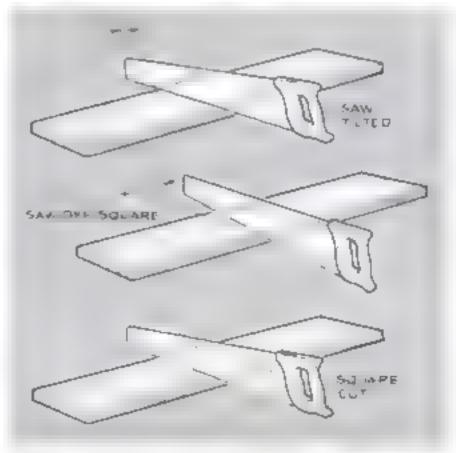
This coat-hanger book lets you tie rose bushes up to a trellis without getting stuck by the thorns. Straighten out a wire hanger, having the original book on the end, then bond in a second U-shaped book 3" or 4" behind the first one as shown above. You can then reach in, pull up a stem and book it temporarily to the trellis, freeing your bands to tie the stem in place.—Louis Hochman, Sherman Oaks, Calif



Kink Reduces Bulb Changing

For easier light-bulb changing in my business sign, I rigged up a terminal block with separate circuits for six bulbs. Using one bulb at a time, I plugged the line lead into that terminal, and when that bulb burned out switched to the next circuit.— Dick May, Riggins, Idaho.

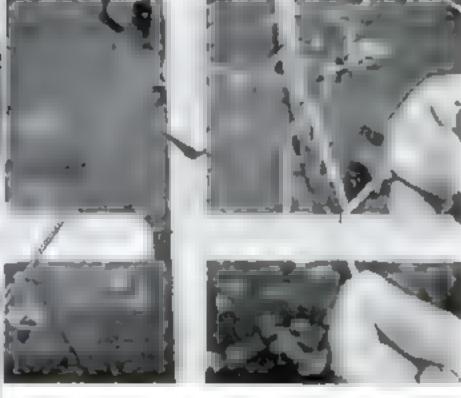




Bright Saw Cuts Square

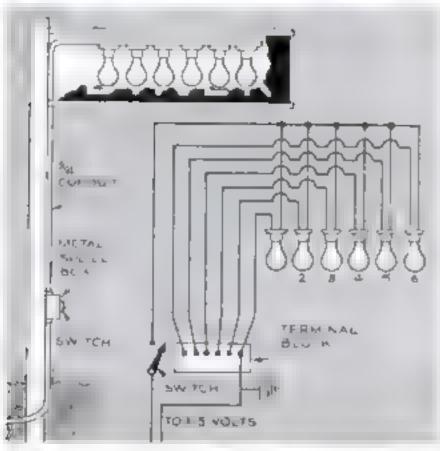
You can saw true and square without a guideline if you keep your handsaw blade shiny. It's an old carpenter's trick to watch the board reflection in the bright blade. When the image is a continuation of work, your cut is square.—Robert Builder Hamilton, Ohio.





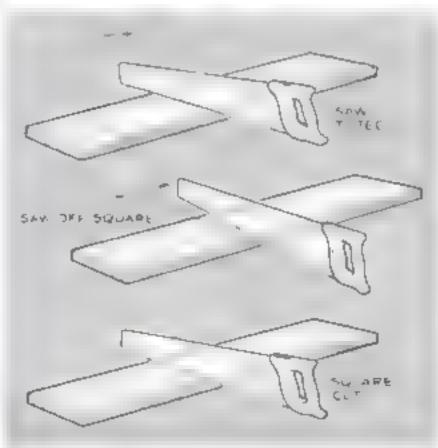
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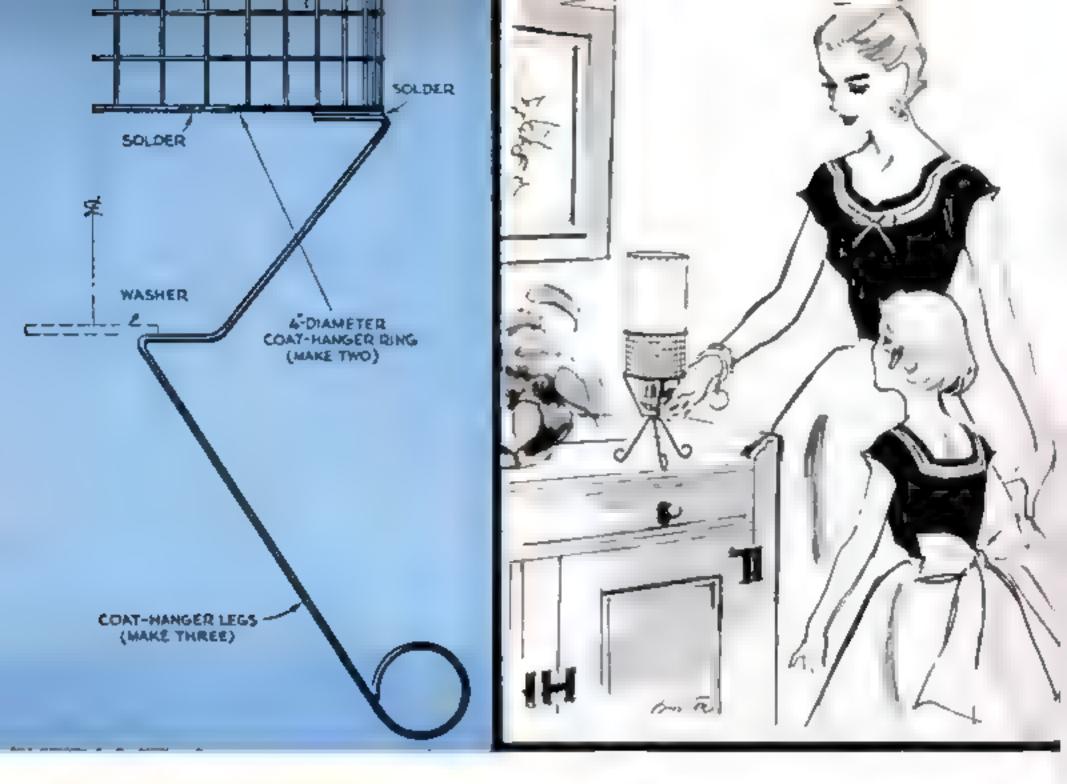
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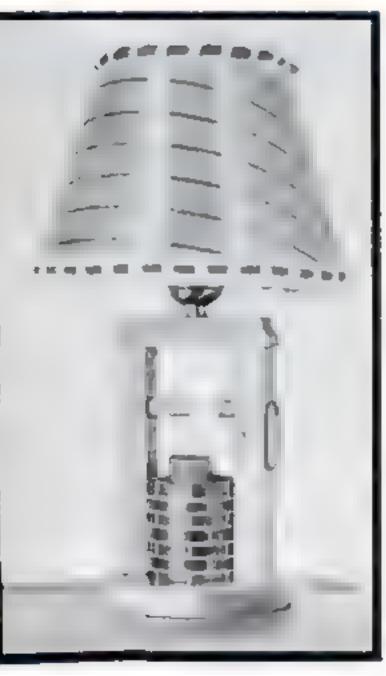
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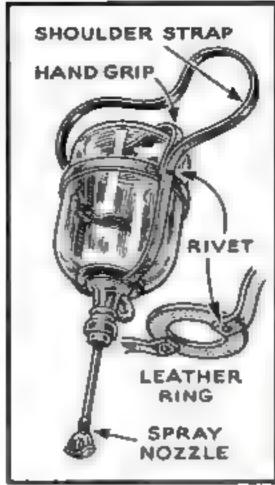
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Harness Holds Sprayer

Spraying weed killer and other lawn chemicals is easy if you make a shoulder harness like this to carry the awkward one-gallon jug. Use web or leather straps and rivet them together. The spray nozzle, available at hardware stores, is made to fit such jugs.—Harold C. Kimball, Salt Lake City, Utah.

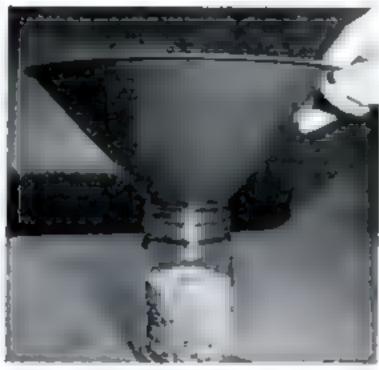
Drill Removes Dust

POWDERED concrete in a drilled hole forms paste if you dampen it, making easy removal possible. Re-insert the star drill, give it a few turns, and pull the paste out.





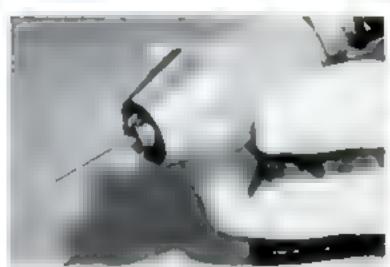
DO IT THE EASY WAY



A WORK-LIGHT SHAPE is a ready-made funnel for pouring small items such as beans, seed and other dry materials into jars or bags. You'll have no spillage.

CUP HOOKS AND SCREW-TYPE BRACKETS can be used in perforated hardboard instead of the regular hangers, if you back the screws with wood blocks.





IN DRILLING PLASTER, a nail with the head cut off makes a good throwaway bit. For larger holes, hammer the point flat and sharpen with a file.

MEED A GROMMETT You can make a rubber one with a turn or two of friction tape around a dowel of the right size. Roll the tape up and off.



Aluminum Barrow Boosts the Payload

This contractor-type barrow is light and tough, easy to build, and it cuts dead weight in half.

By M. G. O'Leary

SHOVING around a 70-lb, wheelbarrow is good for the back muscles. But if you want exercise, why not halve the weight of the barrow and put the extra pounds in the payload?

This hurky aluminum wheelbarrow does just that. Made from standard stock

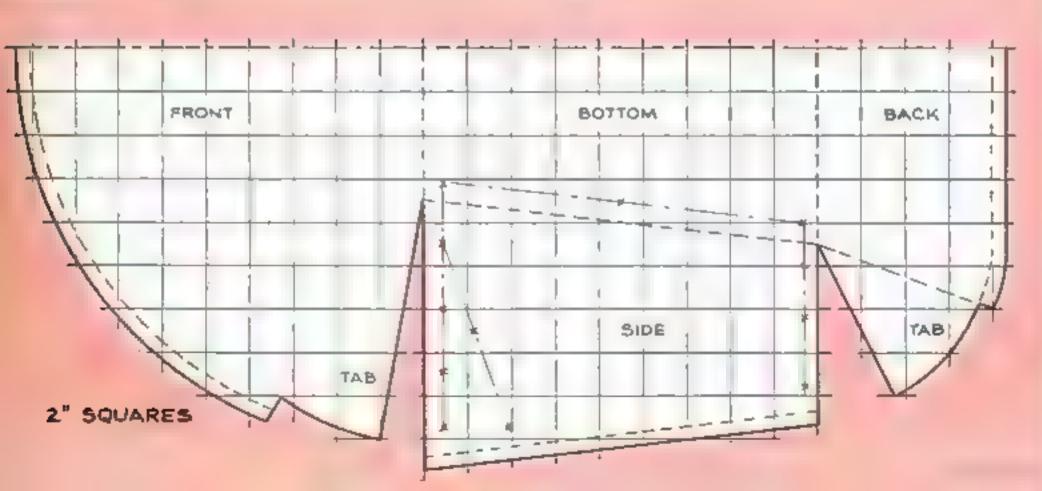
for half the cost of a factory job, it weighs less than 30 lb.

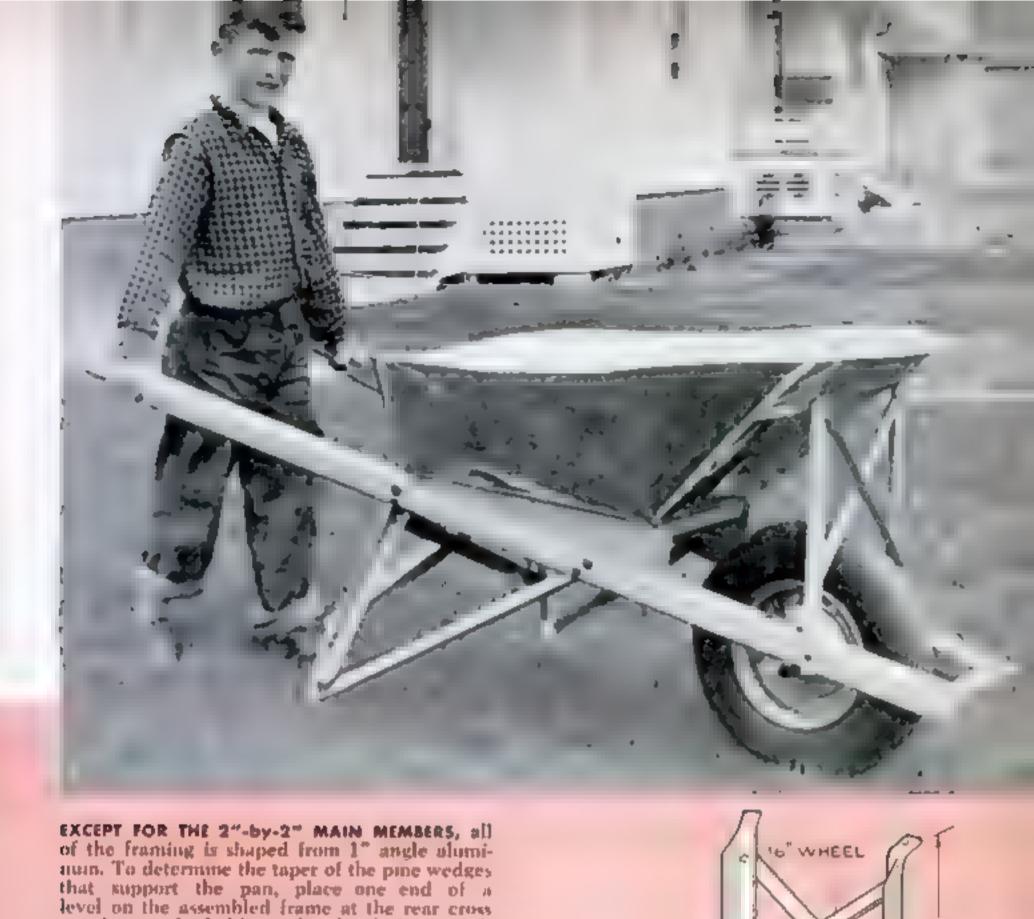
Assembling the frame. The barrow frame dimensions suit a wheelbarrow with a 16" pneumatic-tired wheel, If you use a smaller wheel, increase the thickness of the pine wedges that support the pan.

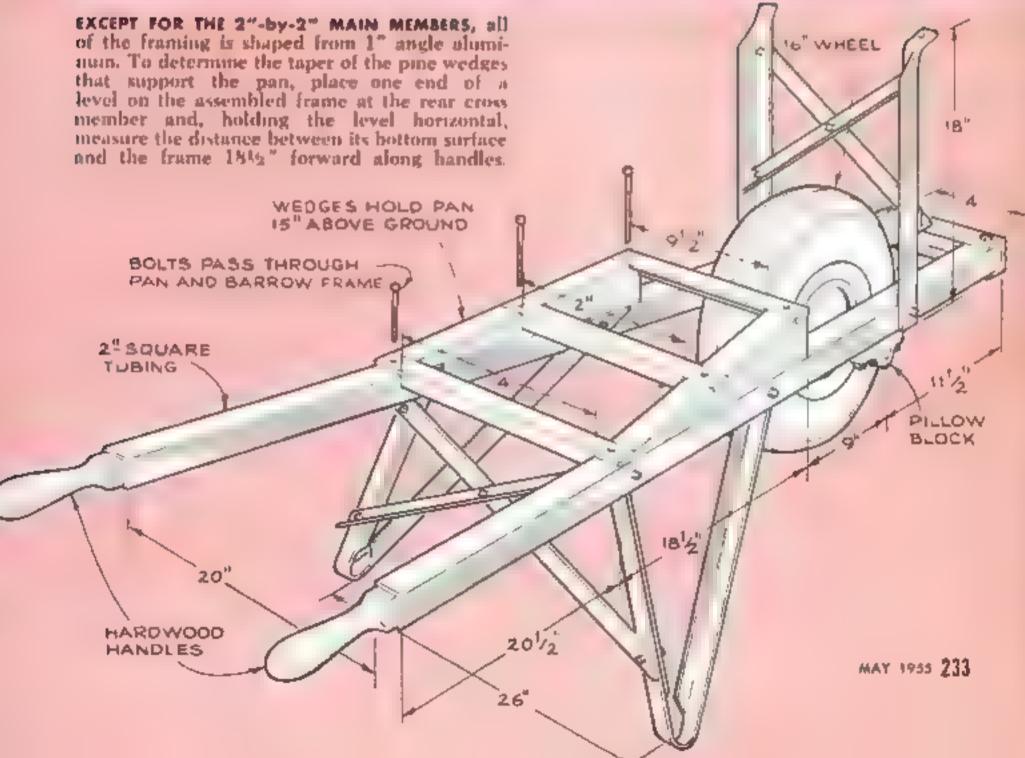
The main frame members are 2"square aluminum tubing and the legs,
cross members, vertical pan supports and
diagonal bracing are all cut from 1"
angle aluminum. Pillow blocks align the
wheel. All connections are made with ""

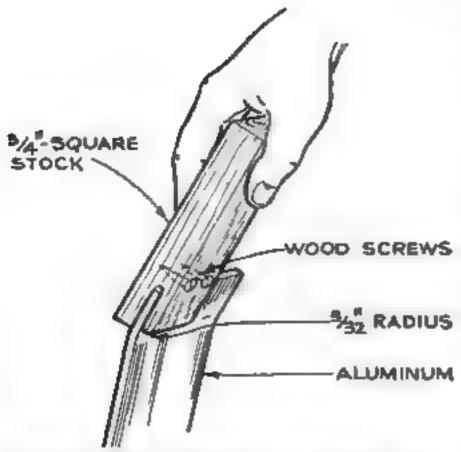


PAN, make a miniature pan from beavy wrapping paper, using the one-eighth scale drawing below as a template. With a little bending, the top edges of the model can be brought to a single, horizontal plane. Checking the angles of the folds in this miniature pan, you can shape the aluminum accurately, without over- or under-bending the springy stock.









brading tool is made of hardwood, reinforced with screws. The bending slot is 3/32" from one face of the block, and %" deep. Round the thin lip to insure smooth bends.

bolts, washers and nuts. The wood handles are turned from 1%"-square stock.

Shaping the barrow pan. Scale up the barrow pan on a 40"-by-48" sheet of 16-gauge aluminum. Cut along the solid lines with large sheet-metal hand shears.

Before making any folds in the metal, form a miniature barrow pan from wrapping paper and study the angles of the folds and the curvature of the lip of the pan. This is important because once the aluminum has been bent it is hard to correct any errors.

To make the folds in the aluminum. lay the trimmed sheet on a box whose top is slightly smaller than the bottom of the pan. Letting the aluminum areas that will form the sides and ends of the pan overhang the box, set one of the fold lines flush with a box edge. In effect, this box edge forms one of the jaws of an improvised vise. For the other "jaw," lay a heavy board on top of the aluminum. Kneeling on the board, use a block of hardwood and a mallet to bend the metal down to the required angle. Repeat the operation to shape the other three pan walls. Then curve the top edges of the end walls with a mallet.

With the pan brought to shape, use C clamps to hold the joints in alignment and drill a single rivet hole through each

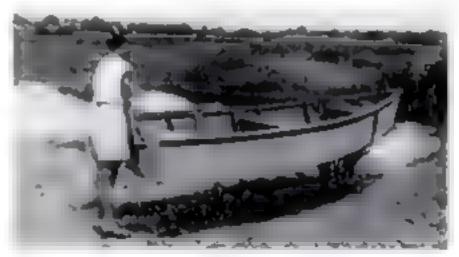
lapped section near its top. Force a self-tapping screw into each hole.

Beading the lip of the barrow pan. From an 8" length of X"-square hardwood, make a beading tool like the one shown in the drawing. Starting at one of the joints, slip the beading tool over the edge of the pan and bend the aluminum outward slightly. Sliding the tool along, continue making bends at X" intervals until you have gone completely around the edge. If the rounded corners at the rear of the pan give you trouble, heat the metal with a blowtorch, taking care not to burn it. The partially annealed aluminum can then be beaded easily. It will take three or four rounds of bending to bring the flange to a right-angle bend.

Now, shape a 9' length of galvanizedsteel wire to fit into the partially beaded edge. Trim the ends of the wire to form a butt joint at the center of the pan front. Using heavy pliers, clinch the wire in place at strategic points. Crimp the rest of the flange with a series of close-spaced bites.

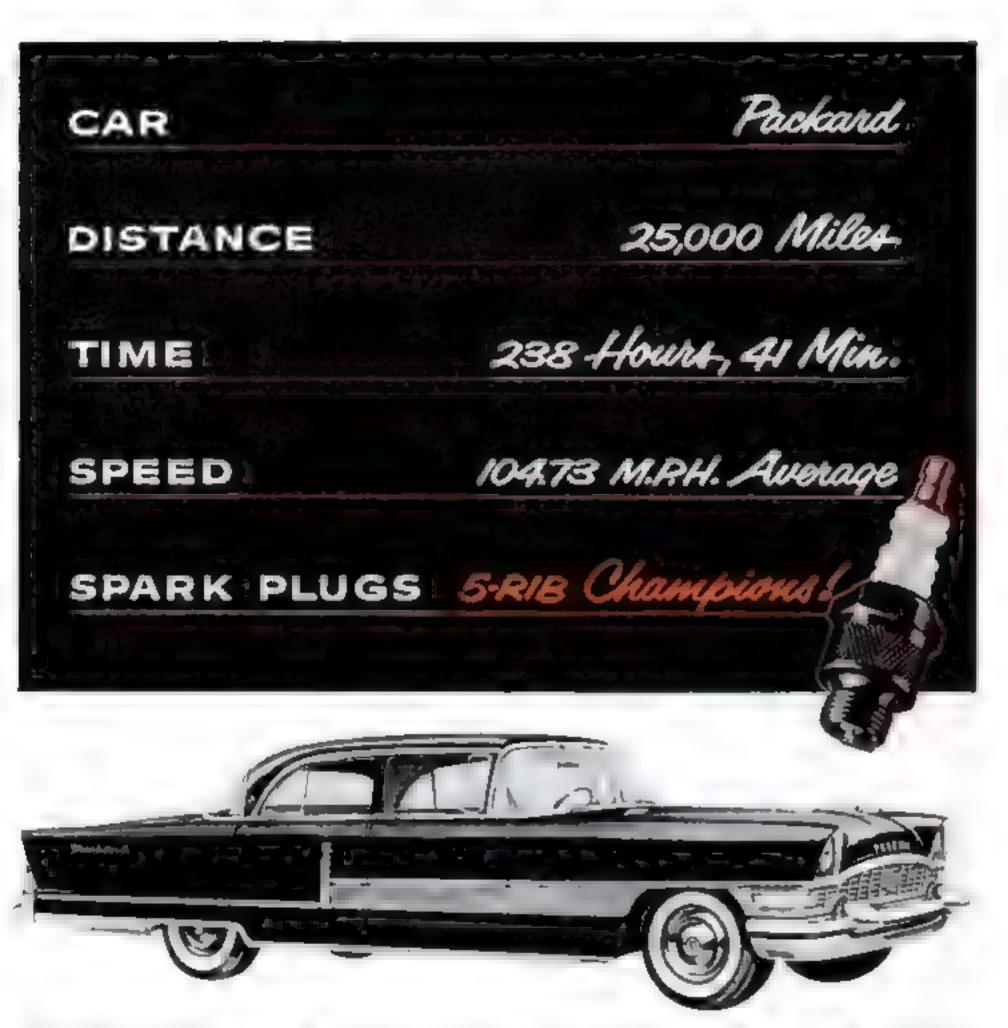
You can now drill the rest of the rivet holes. Insert aluminum rivets and form the heads with an ordinary hammer.

Finally, drill holes in the bottom of the pan for the six bolts that attach it to the wheelbarrow frame.



Barrow Hauls Boat to Water

To Move a flat-bottomed boat a short distance to water, you can mount a wheel-barrow wheel in a fork made of scrap wood and nailed to a crosspiece. Use lengths of pipe for axle bearings. Held with a luggage strap, the barrow takes the weight when you lift the boat by regular transom handles. For a V or round bottom, shape the cross member to fit.—M. C. Beveridge, Fairfield, Conn.



NEVER BEFORE HAS ANY CAR GONE SO FAR, SO FAST!

A Packard Sedan powered by a pre-production 1955 Packard Patrician engine and equipped with regular 5-Rib Champion Spark Plugs made automotive history in this 25,000-mile endurance test supervised by the AAA.

Its dependable Champions functioned perfectly as the car covered a distance greater than the earth's circumference at an average of 104.73 m.p.h.—one of the most remarkable performance runs ever made by a motorcar.

MORE PROOF that full-firing Champions and top performance are a natural combination in any car. MORE REASON you should make the change to Champions—soon!

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

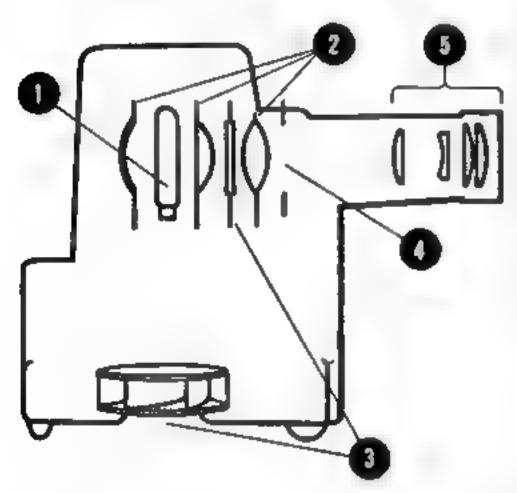
AMERICA'S FAVORITE



NEXT TIME YOUR CAR IS LUBRICATED... HAVE THE SPARK PLUGS CHECKED. IT PAYS!

What makes a Good Slide Projector GOOD?

You can't judge a car by its coat of paint. Likewise, there's more to making a good color slide projector than meets the eye. It has to be a completely engineered system made up of several important sub-systems. If the engineering is good throughout, you have a good projector. As an example, let's use a Kodaslide Signet Projector, shown in the cross-sectional diagram below.



- 1. This is basic power. The higher the lamp wattage, the brighter the screen image. Choose enough wattage to meet your particular needs. 500 watts, with an efficient condenser lens system, provide extra-brilliant big pictures. 300 watts give intermediate brilliance. If you're looking for economy, 150 watts often provide adequate illumination.
- 2. This is officiency. A projector's condenserlens-and-reflector system collects and directs the light from the lamp to your slide. The more efficient this system, the brighter the screen illumination. While a single condenser lens may be used, a compactly designed two-lens condenser system, such as shown here, provides greater efficiency.
- 3. This is safety. Since all lamps radiate heat, special protection for slides is required with higher wattage lamps. For best protection this

should consist of: (a) an extra-thick, highefficiency heat-absorbing glass between lamp and
slide, (b) an efficient blower cooling system (make
sure the blower is quiet and provides a smooth
flow of air) and, (c) baffles to direct air in channels
over lamp, condenser lens system, and slide.

- 4. This is convenience. Slide-changing mechanism should provide smooth, rapid scene change for eye comfort; offer no chance for mix-ups. Kodaslide Projectors' unique vertical feed system provides smooth, almost instantaneous slide change; prevents jarring or movement of projector; eliminates unintentional repeat projection.
- 5. This is picture quality. A good projection lens will faithfully reproduce on the screen all the color and detail of your slides with edge-to-edge sharpness and clarity. Such fine definition and color correction are found in the 5-inch Kodak Projection Ektanon Lenses. You have a wide choice of projection distances and picture sizes to fit living room, classroom, or auditorium.

Lemp Westage		Screen Width	Distance from Projector to Screen 35mm (24 x 36mm) slides	
	15	30 mches	10 feet	
500 <	300 (4 feet	1536 feet	
	((()	5 feet	19 feet	
	1	6 feet	23 feet	
	`	7 feet	251 ₂ feet	
	[9 feet	3216 feet	

All of the above essentials have been given due weight in designing Kodashde Projectors (see facing page). Your Kodak dealer will be glad to demonstrate them and give you specific advice.

236 POPULAR SCIENCE

Here are the newest Kodak projectors

Kodaslide Signet 500 Projector

Lumenized optics, 500-wett lump for amazingly bright pictures; Kodok Projection Ektonen Lans, 5-inch f/3.5; automatic take-up changes gives smooth, quick slide changing; slides

stacked in order shows, in receiver or Kodasilda Bax (see below); accepts Airequipt Changer; individually spring-loaded front legs for 0-12" sleve-tion; adjustable room leveling leg; quiet, powerful impelier-type blower. \$72.50. With 5-inch f/2.8 ions, \$79.50.

Kodaslide Signet 300 Projector

Budget-priced 300-watt version of Signat 500. Has some auparb optics, unique elide-handling system, many other features of Signat 500. With f/3.5 lens only, \$59.50.

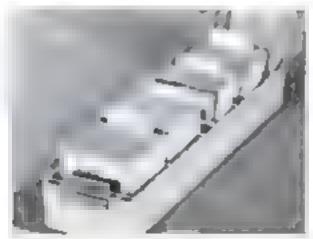


Kodaslide Merit Projector

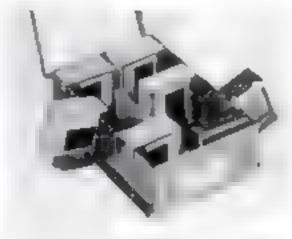
150-watt temp; fine 5-inch f/3.5 Lumenized tens; non-jur feeding; convection coeling; surprising brilliance and clarity at modest cost. Only \$23.95.



KODASLIDE BOX—Holds 20 cerdboard slides. Serves as slide receiver with the Signet projectors. Fits Into Kodaslide Ready-File. 6 for \$.75.



KODASLIDE READY-FILE—Just right for carrying, Holds 200 cardboard or 100 stereo siides, Accepts & Kodaslide Boxes, Includes Index, \$1,95.



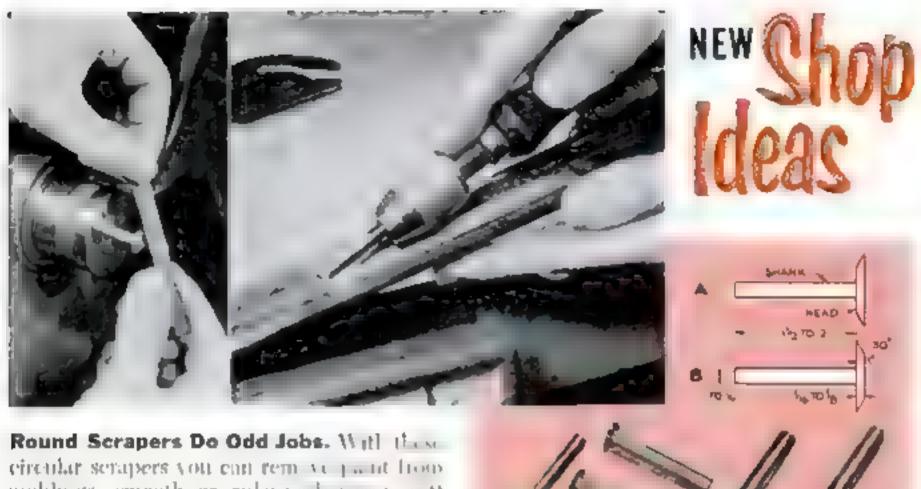
KODASLIDE COMPARTMENT FILE— Holds 240 cardboard or 96 glass slides. 12 swing-out compartments. Includes index. \$3.94.

Prices are list, include Federal Tex where applicable, and are subject to change without notice

EASTMAN KODAK COMPANY

Rochester 4, N. Y.



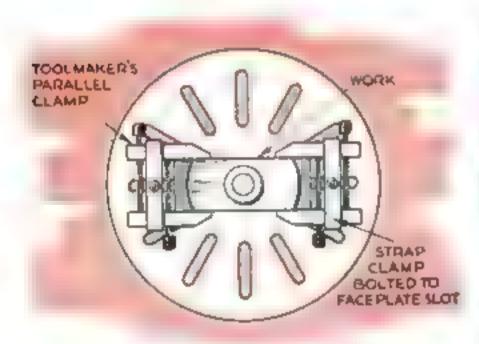


moldings, smooth or enlarge bases it soft materials, make half round grockes is wood. carve wood or plastic, or even by rolling the tool like a rotary kmfe, neatly from cloth or paper,

To make one, chuck a piece of drill rod the diameter of the desired scraper head and turn a 2" shank to fit the bundle the scraper will be used in. Cut off about 14" back of the shoulder so formed, Reverse in the lathe, face true, and with the compound rest form a 50° bevel on the inside or the outside of the scraper head. The shape shown at A in the drawing is best for pushing, while that at B is preferable where the tool is to be pulled or drawn.

Use a file and then a fine abrasive stone to sharpen the edge, as at the left above Heat cherry-red and quench, Temper by heating until a polished area turns light yellow Cool in air.

A pin vise or chuck handle, as in the photo, holds scrapers interchangeably.-Walter E. Burton, Akron,



Mounting Faceplate Work. When work is to be faced right across, ordinary clamps or straps may run afoul of the tool. A convenient way to mount such pieces is with two parallel clamps, Screw these tightly on the ends of the stock, well back from the working face. Hold them on the faceplate with strap clamps placed across their jaws as shown in the drawing above.

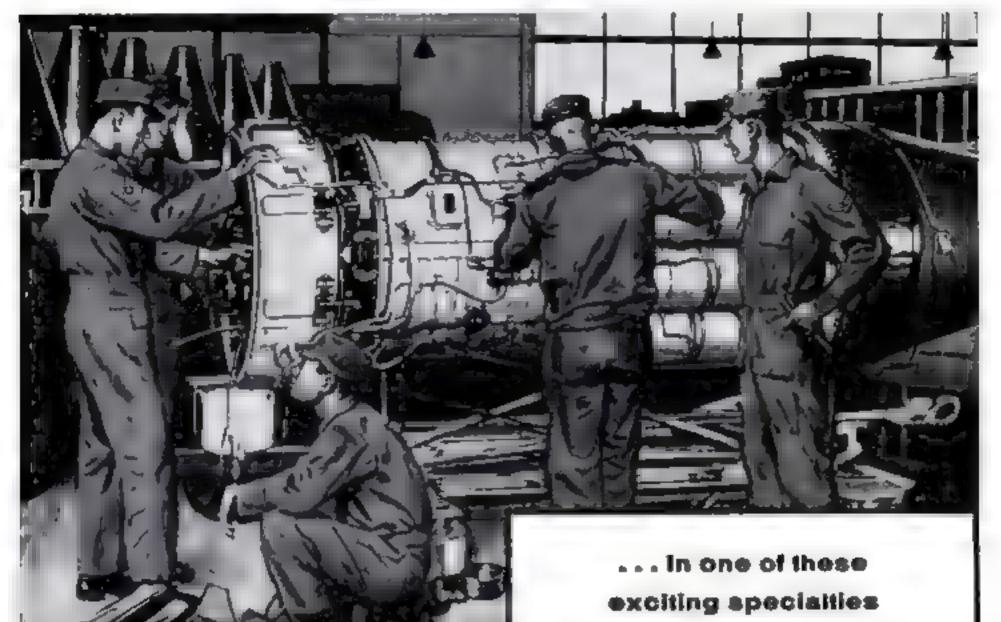


Tool Cuts Parting Pips. A parting tool may leave a small pip on the cutoff. The simple tool above will quickly and cleanly remove such pips from one or many pieces,

Grind a shallow radius across the end of a high-speed lathe tool. Dub off the corners as shown. Lav the pip in the groove and tap the work with a hammer. Use a soft hammer if the finish is important,

You can train

with the U.S. Air Force



Are you interested in engines, electronics, radio, or other technical specialties? If so, you belong in the U.S. Air Force! As an Airman, you may have the opportunity to learn from the ground up, and become a specialist in anything from Turbo-jet mechanics to Radar or Electronics. You'll train with young men, men who will be quick to appreciate your skills and aptitudes.

You'll earn good pay and have unlimited opportunities for adventure and travel. What's more, you'll be assuring yourself of a good future . . . a future in which the training you may receive in the U. S. Air Force will pay you huge dividends for the rest of your life.

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Guided Missiles Supply

Transportation



STUDENTS! Graduate before you enlist

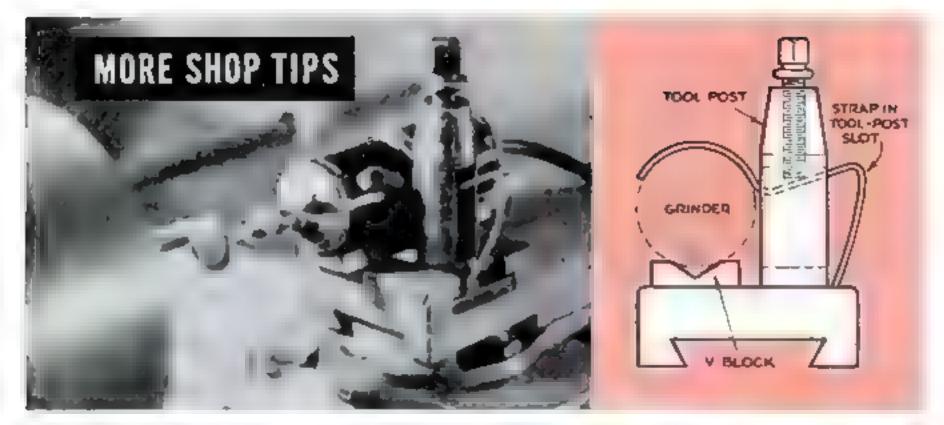
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Quick Tool-Post Grinder. My problem was to cut some berylhum—a very brittle metal that would crumble under ordinary lathe tools. To do so, I rigged a small hand grinder on the carriage. The same setup will do any light grinding job.

TAPEQ SHANK N SPINDLE

Stop Trues Thin Work. Light stock cannot be faced fully across in the steps of the chuck jaws. Held in the straight jaws, it may not run true, or if it does, it may cock as soon as the cut begins.

This spindle stop holds the back of the work square, keeps it from shifting under heavy cuts, and can be used to locate repeat work accurately. It also permits drilling or

boring to be done.

Weld or shrink a disk onto a short piece of drill rod. Drill holes 120° apart in the face and press in hardened dowel pins. Drill and bore a taper shank to a snug sliding fit for the shaft of the stop, and tap for a set-screw. Lock the stop in it; then grind the ends of the three dowel pins square in the lathe. Hold work firmly against the pins while tightening the jaws.—H. J. Gerber, Stillwater, Okla.

Mounting was a simple matter. A piece of strip brass was shaped to the grinder housing and then formed to go through the toolpost slot and bear on the compound rest. A V block held the grinder at center height.— John Henry Tavian, Redlands, Calif.

Monstop Die Holder. With this tool-post die holder, you can run threads of any length on stock fed through the spindle—several feet long, if you remove the tail-stock. Make it from steel, brass or aluminum to suit your dies. Drill and tap a hole in the top for a setscrew.

Mount the holder at 90° to the ways. Then push the tail center up into it, adjusting the cross feed to bring the die on center. Lubricate the work and run the carriage up to it by hand. Once threading, the die will probably feed itself, but give fine threads an assist with the handwheel. Reverse the spindle to back the die off.—Phil McCafferty, Stanwood, Jowa.



Add an extra room to your home —easily, economically



Do it yourself with Armstrong Temlok® Tile and Plank. Finish off unused space in the attic, basement, garage, or enclased parch quickly with these attractive wood fiber building materials. Start by nailing up 1" x 3" wood furring strips at right angles to all framing members.



The Lok-Revel* joint on both Tile and Plank has an extra wide nailing flange for quick installation. This special joint hides all nails or staples, assures near joint lines, helps you do a really professional looking job. With Temlok Tile, you can choose a smooth or a noise-absorbing perforated surface.



3. Temlok goes up fast by either nailing or stapling. Use staples with ½" legs or 1¼" 3d box nails. Four nails or staples should be used for each 12" x 12" or 16" x 16" Temlok Tile. Finish the walls with Temlok Plank. Both Tile and Plank build, insulate, and decorate in one application.



4. Ne pointing needed. Temiok is handsomely finished at the factory. There's practically no mess or waste—once Temiok is installed, the job is done. Add a few decorative touches and you've got that extra living space in the form of a game room, workshop, or bedroom . . . and at low cost.

See your lumber degier now for price, size, and color details on Temlok Tile and Plank and information on other Armstrong building products.

Send for free booklet, "New Ways to Remodel Your Home." Write Armstrong Cork Company, 3705 Washington Avenue, Lancaster, Pennsylvania.

* Trade-Mark









Woodpecker Knocks When Callers Come

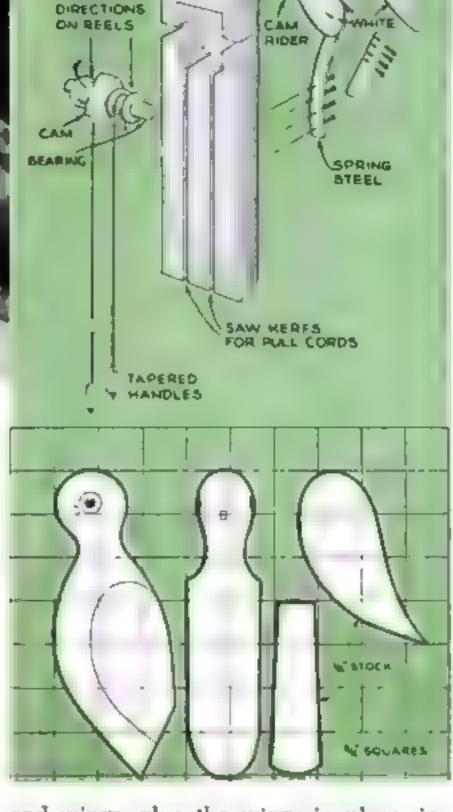
What tyke would use a doorbell with this saucy bird at hand?

WHEN guests pull one of the cords on this novel door knocker a cam revolves, alternately pushing the woodpecker back on a spring and letting him snap forward for a series of sharp raps. Meanwhile, a second cord winds up.

Use a half-section of any log as a mount. Remove the bark and carve a pocket in the flat side for the cam. Extend a smaller channel through the log for the cam rider attached to the bird's breast. Cut slots for camshaft bearings (brass tubing), and saw parallel channels for the pull cords.

Cut the triangular cam from hardwood and wedge it onto a drill-rod shaft, Turn two drums from dowels and mount them on either side of the cam. Attach pull cords to the drums and give one of them six turns. Slip the bearings over the shaft and mount the assembly in the log.

After carving the woodpecker body



NAIL

CORDS WOUND IN OPPOSITE

and wings, glue the wings in place, insert a cut nail for a bill, and attach a cam rider shaped from brass stock to the bird's breast.

A clock-spring tail holds the woodpecker on the log. Fasten the spring to the bird with nails driven through the tail block and on through holes punched in the spring.

Now, cement and tack a strip of birch bark to the log. Before the cement sets, cut a hole for the cam rider and a slot to take the lower end of the spring, which is slipped between the bark and the wood. Attach the spring at a height that lets the cam engage the rider.—

J. M. Finn, Pittstown, N.J.



Her kitchen will always look NEW

She works here... you can make it easier for her!

Her kitchen is really her workshop. She takes pride in it, too—when it's easy to clean up after food preparation or dishwashing.

You can easily give her modern worksurfaces that clean with a damp cloth. St. Regis Panelyte doesn't stain, scratch or grow shabby, Refreshing in color and design.

Ideal for bathroom walls, vanity tops, too. Simple hand tools and Panelyte Contact

Adhesive are all you need to install St, Regis Panelyte yourself. And you make worthwhile savings. Ask your building materials or floor coverings dealer for the large 4' x 10' sheets in one-tenth-inch or one-sixteenth-inch thicknesses.

Ask also for the free "Do-It-Yourself" practical instruction booklet. Or get the coupon off today.



She can have her choice of many accepted designs, each in several caters.

St. Regis Penelyte is menufactured by St. Regis Poper Company, one of America's largest paper menufacturers, with resources ranging from new meterials in its own facest preserves to medien mills and plants and its own notion-wide distribution.

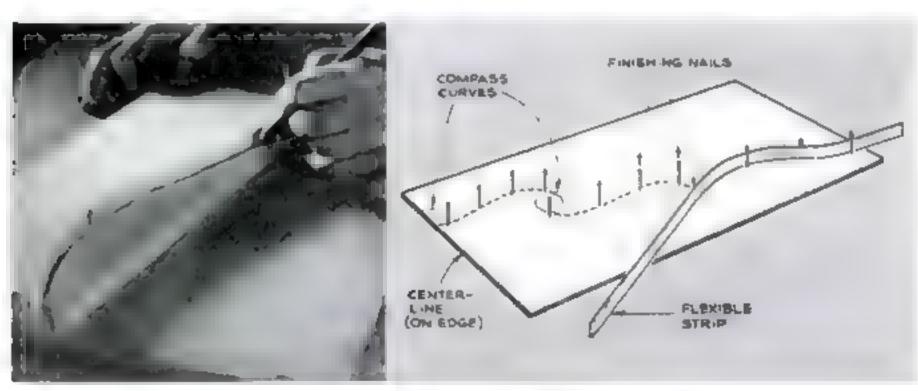
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Glass Candy Case Provides Cold Frame for Early Garden

An our candy case from a salvage yard is a ready-made cold frame for plant growing. The plants get light from all sides, and you can easily reach them for cultivating by just sliding aside the doors in the rear.—John Krill, North Lima, Ohio.



Flexible Wood Strip Helps in Laying Out Pleasing Contours

IF DRAWING freehand curves doesn't come easy, try laving out furniture-top or valance contours this way

On cardboard half the length of the desired design, mark out with a compass any parts that are to have a true radius. With the cardboard on a wooden surface, drive finishing nails part way in at both ends and at points along the line where the curve is to change direction.

Now bend a strip of thin, straight-grained wood to shape over the projecting nails,

flexing it here and there until it takes on a pleasing curve and touches the drawn compass curves. Then trace along the strip with a pencil.

If the curve is broken up, as in the drawing above, treat each part separately, using the strip to lay out a contour on each section in turn

Cut out the profile so obtained and trace around it on the work to lay out half the design. Flip it over for the other half.—
J. M. Finn, Pittstown, N. J.

244 POPULAR SCIENCE



Time to CHANGE OIL and OIL FILTER!

Buds are budding, leaves are leating, spring is springing. Folks everywhere know the first robin is a sign that it's time to change oil and oil filter, too.

An AC Filter keeps oil free from harmful dirt, protects your car's engine from the damage dirt can do. In fact, an AC Filter takes out particles as small as 1/100,000 of an inch... unbout removing the detergents from beavy-duty oils!

So, change to clean oil now, and keep it clean with a new AC Oil Filter. Change your AC Filter every 5,000 miles. That's the best way to keep "spring" in your engine all year long—and for years longer!



AC SPARK PLUG DIVISION - GENERAL MOTORS CORPORATION

THE ONLY FACTORY-APPROVED FILTER FOR CADILLAC . BUICK . OLDSMOBILE . PONTIAC . CHEVROLET . GMC

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HECK THE DELTA TOOLS YOU NEED TO COMPLETE

1 DELTA 8" Tilting Arbor Saw

Most widely used home workshop saw in the world. Famous Delta 10" Unisaw also available.

2 DELTA Deluxe 4" Jointer

Puts a professional finish on stock up to 4" wide. New Delta 6" Long Bed Jointer also available.

3 DELTA 11" Drill Press

Drills, mortises, routs, carves, shapes, and grinds with precision and speed New Delta 14" Drill Press also available.

4 DELTA Righ Speed Shaper

Cuts smoothly and rapidly at all possible angles to the grain. Interchangeable spindles for wide variety of cutters. Cabinet model also available.

5 DELTA 12" Wood Lathe

Finest home workshop lathe built. Turns wood, plastic, and even light metals. 11" model also available.

6 DELTA 24" Scroll Saw

For fast, accurate, intricate curve cutting. Speeds up to 1700 smooth cutting strokes per minute. 16" model also availbale.

7 DELTA 14" Band Saw

Most rugged and accurate band saw of its size. Cuts up to 6" hardwood smoothly, curve or straight line. Delta 10" Band Saw also available.

8 DELTA 81/2" Disk Sander

Sands, drills, grinds, buffs—puts professional finish on straight, curved, or angular surfaces.

9 DELTA General Pur Bench Grinder

Most rugged, powerful, fast, and smooth running home workshop grinder built today! Used in many undustrial shops.

YUU'U LIKE IU V

IN DELTA USERS'

"Finest Home Workshop" Contest

There's still time to get into Delta's big contest to discover the best home workshop use of the finest tools made today. If you own three or more Rockwell-built Delta tools (the DeltaShop counts as four) you have as good a chance as anyone to win the first prize of \$1000 worth of Delta Tools of your choice, or thirteen other valuable power tool prizes!

Delta Quality Makes The Difference

In the picture at the left are just a few of the many Delta Tools from which you can choose if you win. And if you're like most real home craftsmen, you know there just aren't any finer tools made. Delta is the power tool pioneer, with years of experience in building precision tools to meet the exacting standards of industry. In fact, many of the tools from which you can choose as a winner are the same quality tools used in wood and metal working plants throughout the United States.

Get Started NOW

The big Delta contest closes July 15th—there's still plenty of time to enter, and win. The Official Entry Form (which must accompany your entry, gives you the complete contest rules, the complete list of prizes, and tells exactly how to prepare your entry. Get yours from your Delta Dealer the's listed under "TOOLS" or "MACHINERY" in your classified phone book), or send the coupon below.

DELTA QUALITY POWER TOOLS

Another Product by ROCKWELL



Delta	Power	Tool I	Division,	Rockwell	Mfg.	Co.
504-E	N. Let	inglo	a Ave.,	Pittsburg!	h 8, 1	Pa.

- Please send me an Official Entry Form for the Delta Users' "Finest Home Workshop" Contest.
- Please send latest Delta Homecraft Catalog (10¢ enclosed).
- Please send Delta "B" Catalog, showing Delta's larger units, such as 6" jointer, 24" scrall saw, 14" band saw, etc. (10¢ enclosed).

Name. ______

City_____County____State_____



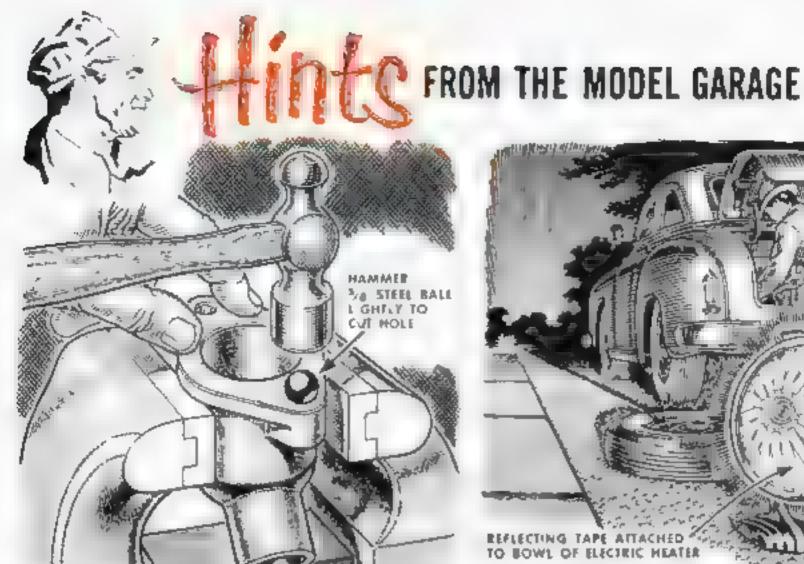


YOUR SHOP

DELTA Accessories:

Delta matches the world's most complete line of fine power tools with the most complete line of accessories to make each Delta Tool even more versatile, more useful. Accessories also available as prizes to winners.

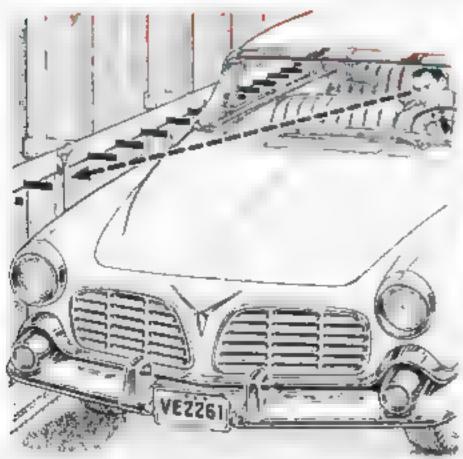




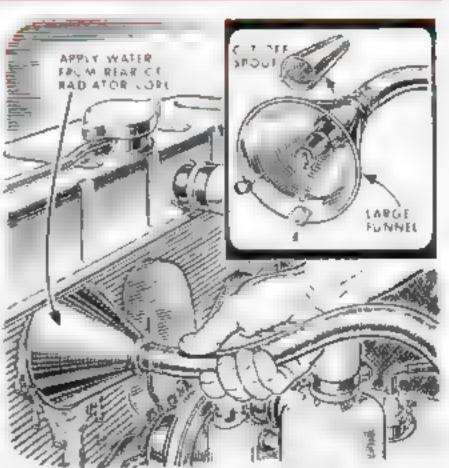
In making a gasket, you can locate and cut bolt holes in one step with a steel ball slightly larger than the hole. Cut the gasket to shape and place it on one surface to be joined. Tapping the ball lightly over the hole makes a clean cut.



A roadside reflector can be made from a discarded electric heater of the reflector type by covering the concave surface with lummous paint or strips of reflector tape. It makes a neater job if you first remove the wiring and old heater element.



instailing a guide rail on the opposite garage wall helps you leave room to get out on the driver's side. When the fender guide on your car just touches flexible fingers cut to length from an inner tube, there's room to open the other door, too. Insert fingers in saw slots in a one-by-three.



Cleaning radiator-core openings to free them of collected insects can be done without wetting the ignition. Cut off the spout of a funnel and adapt the top part to fit over the hose nozzle. Splashing water will be deflected back to the core and run harmlessly to the ground.

Here's what



found out about Car-Plate -

Easiest way to put on the toughest kind of wax

EVEN AFTER 3 MONTHS-CAN YOU PICK THE CAR-PLATE WAX SIDE FROM THE HARD-RUB AUTO WAX JOB?

HERTZ picked 20 of its rental cars in cities across the U.S. One side of each was waxed with liquid Car-Plate, the other with one of three well-known pasts waxes.

HERTZ FOUND: Car-Plate is far faster, easier to apply than any paste auto wax.

After months on the road, the sides were compared for wear and shine.

HERTZ FOUND: Car-Plate lasts as long as the most durable paste auto wax.

The reason: All the Car-Plate wax stays on your car—you don't rub wax off as when polishing paste wax. The Hertz test car shown here was driven 3 months, then simply washed and photographed. If you can't tell the Car-Plate side (right) from the paste side, why waste hours rubbing? Next time wax with Car-Plate!





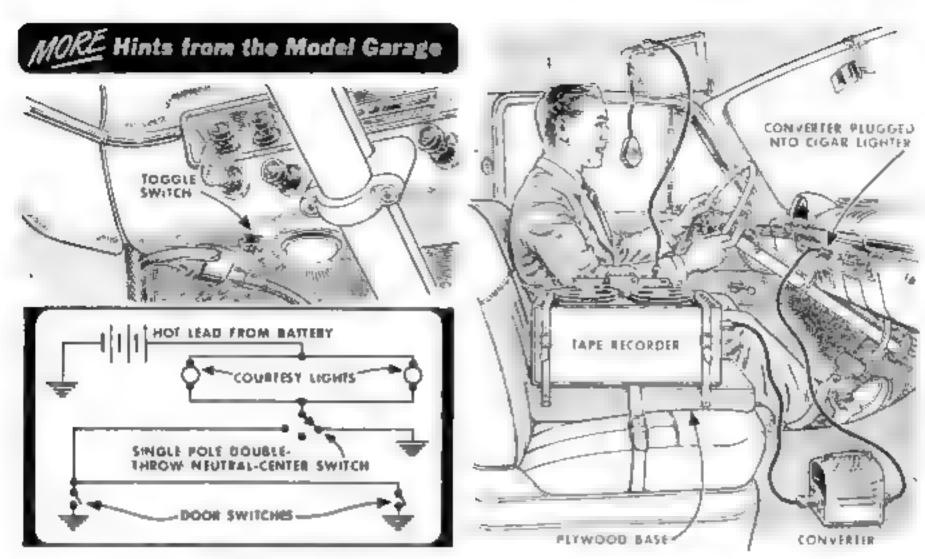


Before waxing use Car-Plate Cleaner, Wax will bond perfectly in a brilliant, long-lasting finish.

JOHNSON'S

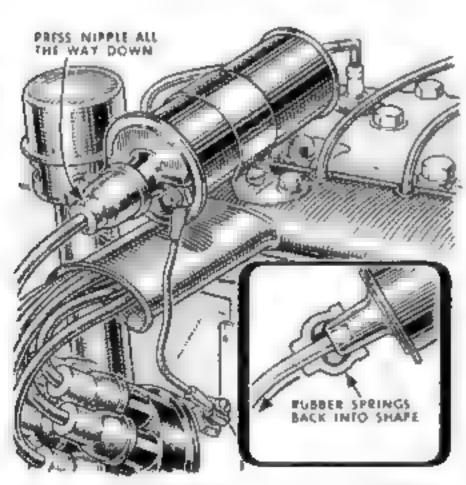


CAR-PLATE WAX

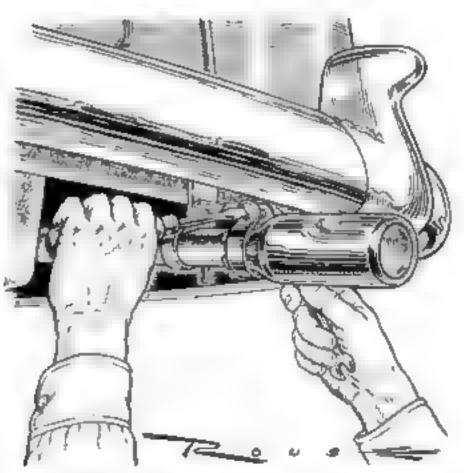


Courtesy lights or dome lights can be controlled with a three-way toggle switch in the circuit. On one side the switch gives you light while the doors are open; on the other the light remains on whether the doors are open or shut. The center position is at "off" at all times.

An office-in-the-car is easy to contrive with a tape recorder mounted on the front seat. To keep the recorder level, strap it to a plywood base having sides curved to the contour of the scat. It's a business-trip convenience to permit report dictation while held up in traffic.



When rubber boots are used on ignationcoal or distributor high-tension wires, you should push them all the way down on the tower. Otherwise the tendency of rubber to spring back into shape may force the wire out and break the connection.



An exhaust deflector clamped on the end of the tailpipe is not just for looks. It is a good way to keep exhaust gases from discoloring your bumper chrome. Bushings are available for clamping a deflector to a small-diameter or oval tailpipe.

WANT THE

COOLEST SMOKING MIXTURE

YOUR PIPE EVER HAD?

ANSWER IS IN THIS POUCH!



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HAVE SWITCHED TO HOLIDAY

Only Holiday gives you this custom bland for Mildoess











Yes, five famous tobaccos skillfully blended into a mixture of unequalled flavor, aroma and midness. These fine tobaccos selected from all parts of the world, are blended with a base of cool-smoking white burley to make Holiday America's finest pipe mixture. Try a pipeful . . . enjoy its coolness, flavor and aroma . . . and see for yourself why more and more men who smoke mixtures are switching to Holiday as a steady smoke.



Only Holiday has this Wrap-Around Pack!

No other pocket tin or pack will pass the "Goldfish Bowl" test. Try it yourself—it's absolute proof that the Holtday pouch is sealed air-and-water tight, guaranteeing you a fresher, coolersmoking tobacco.

HOLIDAY

SMELLS GOOD — SMOKES GOOD

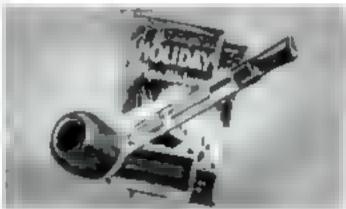
AMERICA'S FINEST PIPE MIXTURE! -

AF STRAIGHT BURLEY

Try Edgeworth — choice cool smoking white burley in the airtight pouch. America's finest pipe tobacco.



SPECIAL OFFER 150



Get this new polished aluminum stem "Park Lane" pipe with interchangeable imported briar bowl and exclusive "dri-dome" which traps moisture to insure a dry, cool smoke—along with 2 full-sized pouches of Holiday Tobacco. If your dealer cannot supply you, use this handy order blank.

Name	
Address	
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Mail with \$1.50 to Park Lane, Larus & Brother Company, Inc., Richmond, Va. Offer good only in the U.S.A. ?5-5

(Continued from page 170)

less for me to install one of my batteries in the car. Doe might just be cunning enough not to leave a switch on at night—it wouldn't prove a thing. I've been over this car with a fine-tooth comb. There just isn't a short in it."

"It's got to be the battery then," Stan

declared.

"I just can't believe that," Gus said.
"Not when Williams has tried three different batteries."

GOING over the problem again, Gus could see no other alternatives: There was either a slow juice leak or Doc was deliberately killing the battery.

To get around this latter possibility, Gus arranged to have the car left at the Model Garage for several nights. Strangely enough, the buttery held full charge now. This pointed a finger of suspicion squarely at Doc, Still, Gus couldn't believe it. Doc, he told himself, would be one to gallop a horse in the streets in protest, but he wouldn't stoop to take unfair advantage. With this thought firmly in mind, Gus went to work again on the big sedan.

He crawled under it like a badger, going over and checking everything he had done before. He polished and tightened terminal nuts, cleaned and tightened battery leads, spread and taped wires.

There seemed to be little to gain from road-testing the car, since it always went dead while parked at night. It had to be something, Gus thought, that Doe did to the car on one night, that he didn't do on another.

In desperation Gus disconnected the field lead wire from the voltage regulator and hooked an ammeter, which he knew he could trust for accuracy, between the hot terminal of the starter relay and the car's circuit. He'd drive the car now, Gus thought, and if the slightest short developed under road stress, he'd know it.

As Gus started out, the car interior was cold, so he snapped on the heater and defroster fans. Everything seemed

to be working right, the generator doing its job, ammeter reading steady.

It was morning, and the sun soon began to work on the car's windows. Shortly the interior became too warm for comfort. His mind occupied, Gus leaned over and opened the cowl ventilator. Immediately the ammeter showed an extra six-ampere draw. That was queer, Gus thought, He closed the ventilator and the six-ampere draw went away. A gleam of satisfaction came to Gus's eyes.

"Maybe," he said aloud, "I've located

something."

AT FIRST glance there seemed to be no way that the opening of the ventilator could produce juice drag on the circuit. The opened cowl ventilator shoved the defroster air hose against a hot lead on the firewall. But, Gus reasoned, what of it? That hose was made of rubber. It couldn't cause a short.

But minute inspection showed that there were stiffening wire windings in the air hose. A tiny spot of wear exposed a mere pinpoint of wire. This, when against the hot terminal, carried juice in the manner of a resistor, while limiting it to six volts. It wasn't enough to get the wire hot, but it was enough to kill a battery overnight.

If Doc left the ventilator open at night he got a dead battery. Closed, the bat-

tery stayed up.

"Just goes to show you," Gus told Doc, "how tough things can get in this business. A man might have missed that fouled-up ventilator forever. And you, Doc, at your age, should be ashamed of yourself, galloping around town like a mad hatter."

Doc puffed reflectively on his pipe. "The old mare," he said, with a twinkle in his eye, "had more sense than this old fool. She didn't want to make that run. I'll go around and apologize to her—and to Roy Williams, too."

"That," Gus told him, smiling, "would be a darn good move, Doc." END

NEXT MONTH: Gus and the balky jeep.

Quiet...as a tiger on the prowl!



(Continued from page 107)

seldom has time enough for all these side shows. The center ring, where final assembly takes place, is a one-story building a couple of blocks long. Surprisingly, it is not a straight-line deal with bits moving in one end and cars driving out the other. Instead, the final line writhes around like a snake with a stomach-ache, wrapping itself about internal lines, splitting into branches and knotting into transfer points.

Let's imagine that, a few days ago, you ordered a red V-8 Hudson Hornet with air conditioning (live it up, boy!), and that I went for a green Rambler wagon with overdrive. Back in Scheduling, Al Pryse has performed his rites and the conveyors are loaded up to bring first your car and then mine to the final line. We walk to one end of the building and stop by an immense vista of tightly packed "Wash" bodies—shop talk for Wasp, Ambassador, Statesman, Hornet.

These bodies were hauled down from Milwaukee, six per truck, and shunted onto one of 16 body-storage conveyors, each 38 bodies long. They feed the Nash-Hudson part of the final line, acting as a reservoir or "float." There at the front of one line is a red Hornet body

-your car.

Quickly the body is hoisted up and plunked down so that it moves sideways on a new conveyor. Traveling at a slow saunter, it passes between several hundred people who add wiring, tubing, steering, front suspension, shocks. You pause to watch a man put on a front coil spring (air-compress it, clamp it, fit on car, recompress it, pull off clamp). Then temporarily leaving your Hornet, you walk on to a strange line tucked within the main one.

Lasy Susan. Officially it's "front-end sheet-metal assembly." Actually it's an endless oval of moving fixtures, each on a traveling platform, Supplies of screws, rivets and chromed brand medallions are racked on each fixture. Workers step aboard the platform, do a couple of jobs and step off. Fenders, grilles, radiators

and headlights funnel in to feed this huge lazy Susan. You see a red Hornet front end take shape, and behind it a green Rambler one. They go off in what seems to be the wrong direction, but they'll be back.

By now your Hornet's body, sporting its front suspension and wiring, reaches the end of its "make-up" line. Deftly switched hoists swing it high in the air where it neatly fills a gap in a file of semibuilt cars rolling by overhead. Each body hangs from a carrier with four J-shaped hooks. Following your Hornet is a green Rambler wagon—on the final line, Ramblers alternate with Nash-Hudson cars.

Motors meet. Farther along, a line marches in with engines and, to no one's surprise but yours, deposits a big V-8 with air-conditioning compressor on it just ahead of your car. Swiftly a team of eight or nine people take over. One man snares the engine with a hook; another thumbs the hoist controls to swing it up in the air, its transmission low; and others shoehorn it diagonally into its nest between the wheel housings. Immediately a masked welder appears on a moving cart and proceeds, alarmingly, to strike an arc by the front mount.

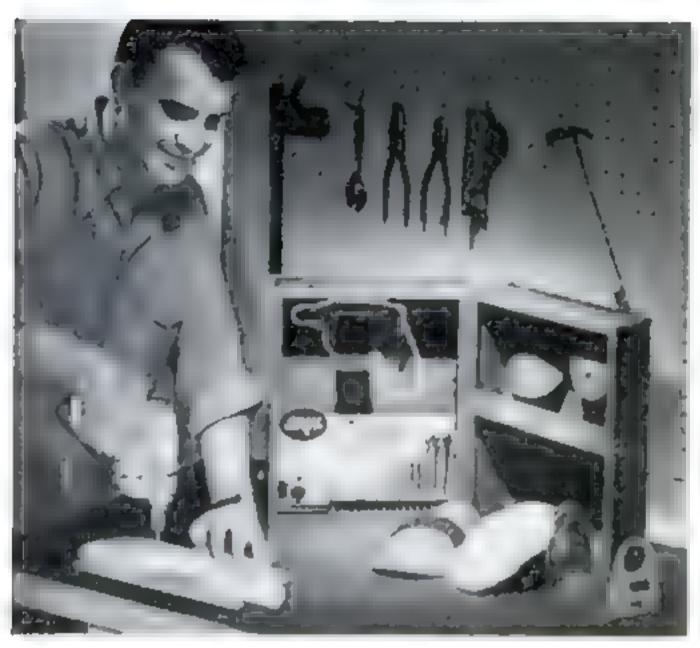
Distressed by the thought of an engine welded in place, you almost squawk in protest before you see that he is actually welding on a cross member that came bolted to the engine. In the future a mechanic can still pull and reinstall the engine; but on a line moving up to 50 feet a minute, with only seconds available, the V-8 slides in easier if the cross-piece comes later.

Meantime I've been goggling at the way they've popped an L-head six into my Rambler. Here the crosspiece was already in, so they dropped the hook through the front opening and snugged the engine up from beneath.

Things happen fast now. Another crew has trundled up a rear axle and torque tube under the Homet on a high,

[Continued on page 256]

A WHOLE SKIL WORKSHOP for only \$3925!



Now! Own This Famous 32-Piece SKIL Drill Kit At Big Savings!

Try this kit and you'll fall in love with it' Amazingly versatile... and so superbly made that any craftsman will appreciate it You'll use it for literally hundreds of jobs . . . sanding, drilling, pulishing, grinding, were brushing.

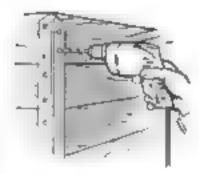
There's never been a tool value like it. A powerful 14" SKIL Drill plus a whole battery of useful, high quality accessories. Compare this drill and attachments with any other. Tool for tool, there isn't a kit on the market that offers as much value. Made by the famous SKIL Corporation, for over 30 years leaders in the manufacture of quality electric tools.

Just look at all you get!

Model 549 SKIL Drill with geared chuck... Drill Stand...
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Model 515 Drill Kit—all this for only \$39.95

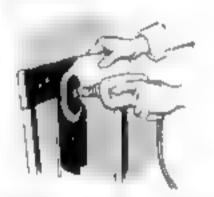
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Polish furniture, shine the auto easier and faster

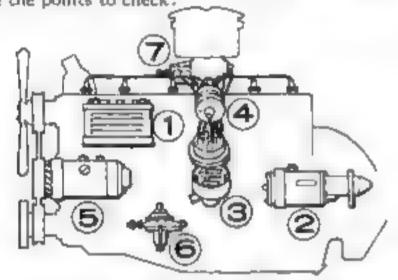


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Care and Feeding of Engines S. P. CORP

TUNE-UP TIME

Lagging engine performance calls for a tune-up. Here are the points to check:



1 BATTERY— Test voltage of each cell. Cells should be equal, Tighten all connections, including those behind instrument panel

COMPRESSION—Test compression of each cylinder They should be within 10 lbs. of each other, and up to manufacturer's standard of 110 to 120 lbs. Low reading indicates leaking rings, valves, or head gasket

VACUUM TEST-A vacuum gauge connected to intake manufold may indicate poor ignition, carburetion, or compression, which may be due to one of the following:

2. STARTER MOTOR—Test voltage and amperage draw while starter in cranking engine. See diagram

3. DISTRIBUTOR—Remove and check in a distributor tester for operation of all speeds. Test manual and vacuum advance. Time the engine

 COIL—Use coil-tester to test output at all speeds. GENERATOR—Test against manufacturing specifi-

6. FUEL PUMP-Test pressure, vacuum, and volume MUFFLER SYSTEM—Check for any exhaust restrictions. CYLINDER HEAD-Tighten all cap acrews and maniford nuts to specifications, while engine is hot

7. CARBURETOR-Clean carburetor and air screen; check float level and jets against specifications.

VALVES - Adjust tappets while engine is hot, unless manufacturer says adjust while cold.



NEW PREE REFERENCE BOOKLET A post card request will bring your free copy of "Care and Feeding of Engines," with many valuable do-itvourself details on car care. Use Sealed Power KromeX Ring Sets for immediate oil control, finest performance, and longest wear in modern engines. Sealed Power, Dept. H-5, Muskegon, Michigan,

How They Produce Cars Nowadays [Continued from page 254]

jack-elevated dolly. Watching the seven pairs of hands under the moving car, here about five feet off the floor, you note that most-not all-of this team are short people. "We do try to match a man's job to his size," a foreman answers you. "But there's a limit to the number

of real short guys I get."

Slanting down until the cars are only a foot or two off the floor, the J-shaped carriers curve back to their date with the lazy Susan. Like a glove going onto an outstretched hand, a complete front end slides onto each car. High-cycle and air-driven tools secure it in seconds, After a plunge into a noisy tunnel for undercoating, the cars curve onto a long, straight line that looks at last the way you thing it should. On go mufflers, tailpipes and bumpers. The big J hooks delicately deposit each car on a moving chain and go sailing off overhead.

Smokers and cripples. Each car has a rendezvous with its wheels, which come sliding along, five of a color, on an overhead chute. (The chute divides in two. with an ingenious selector diverting three of a color to one side of the car and two to the other.) In go mats, seats and spare tires; from beneath each car a clatter of air tools tell of activity there, too. You watch a man connect the cables to a newly installed battery. "Naw," he tells you, "Don't get one 'smoker' in a hundred. If she does smoke, you pull off the cable and they check wiring later. Just means somebody's connected something wrong."

In go oil, water, gasoline. Then a coveralled man slips behind the wheel of your Hornet, flips the switch, runs the starter for a few seconds. The engine catches and he drives your car off the line. Another man steps up (be careful of my babyl) and drives the Rambler off under its own power. You wait while a dozen cars go by, obscurely hoping one won't fire up. But they all do, and you question a mechanic nearby.

"Sure, we get a cripple occasionally.

[Continued on page 258]

Thrill your child with this drop-leaf desk and bookcase!

get complete detail drawings, photograph and directions in

FREE PATTERN KIT 305

- along with picture-packed booklet, "Friendly Hame Ideas in Western Pine." Write for it to Western Pine Association. Dept. 305-L. Yeon Building, Portland 4, Oregon.

the Western Pines PONDEROSA PINE

This desk - scaled to a child's proportions - is just like a grown-up's with pigeonholes, pencil racks, drawer, shelves and cabinet. And the mellow woods of the Western Pines* lend their own special charm to the simple New England design.

It costs so little to build this desk with the woods of the Western Pines. You'll find that they cut clean and accurately with hand or machine tools and take all finishes well.

Ask your local lumber dealer for the woods of the Western Pines - he'll be glad to give you an estimate!

TODAY'S WESTERN PINE TREE FARMING GUARANTEES LUMBER TOMORROW

11%" wide

UTICA® Adjustable Wrenches

GOOD TURNS

Yes, many, many good turns because they offer you a very special Utica feature. The jaws

hardened by Utica's own process of electronic induction. Jaws resist nicks and burre, stay smooth and new-like up to 10 times longer than ordinary adjustable wrenches.

An adjustable wrench is a mighty handy tool, but be sure to look for the name Utica on the handle, Sizes from 4" up to 18"



UTICA 4, N. Y.

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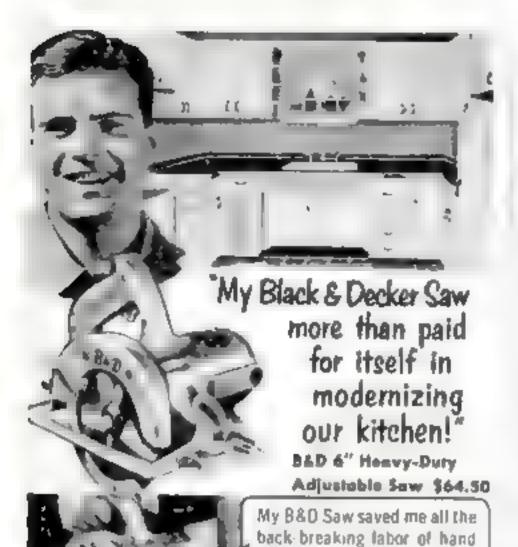
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Just plug in the amazing FRIGIDAIRE electric DEHUMIDIFIER

Positively controls moisture in workshops, basements, or any closed area up to 10,000 cu. ft. where moisture is a problem.

See your Frigidaire Dealer for further details. Or write for free folder to Frigidaire, Dept. 2331, Dayton I, Ohio In Canada, Toronto 13, Ontario,

Built and backed by General Motors



Even cutting the hole for the sink was easy—and safe— thanks to the lift lever on the blade goard

Sawing. And it cut really

straight - I could see the

blade follow the line

Send for your copies of the East Bild* Kitchen Cabinets pattern and Black & Decker's "Handy Tips" booklet. Use " coupon below



B&D 6 inch Heavy-Duty Saw—a professional tool at a popular price! Features a specially-designed, better-built B&D motor that cuts wood like butter; instant-release trigger-switch and telescoping brade guard with lift-lever for safety. Cuts 2 inches deep, adjustable from 0° to 45° At hardware, lumber & department stores.

See "Tools-Electric" in phone directory for

ELECTRIC †0018 4, \$055, Towsen 4, Md
) percu: \$1.00)
Descus Stribol
25c)
_

How They Produce Cars Nowadays [Continued from page 256]

That's why I'm here. Usually just means a wire's off or the fuel isn't getting through."

Ahead, three freshly started cars are on test rolls—floor rollers that let an inspector drive an unmoving car while he rates brakes, transmission shifts and speedometer calibration. Then the newborn cars pass in slow double files over two long pits for an ordeal called Final Tune-Up and Inspection. Quick, elever machines align front wheels and headlights. Scores of specialists soberly scrutinize each car, rating it on a check list. Cars with a clean bill of health roll off to Shipping; those that flunk go to a Limbo called Final Repair.

There painters, mechanics and sheetmetal men do whatever has to be done before the cars are resubmitted to inspection. Your Hornet and my Rambler, however, sailed right through like most cars. Now they are waiting for us to baby them.



Compressed Air Splits Logs

A RETIRED admiral, L. J. Hudson of Carmel, Calif., here demonstrates his ingenious method for feeding the fireplace. He bought a used air compressor, attached it to a Thor pavement breaker and made his own splitting wedge. He says the angle of the wedge is the key to its success.

HOW AUTO ENGINEERS KEEP THEIR CARS TUNED UP WITH MIRACLE POWER

When engineers take a technical product to their hearts, you can bet it's really good. And auto engineers themselves tune up their engines with Miracle Power.

They know that most motor wear takes place in the first five minutes after you start your car, before oil has been pumped to all moving parts. They know, too, that the temperature in combustion chambers goes as high as 1400° F, while oil burns off at 550° F. And oil that's burned off can't lubricate. That's why even new cars can develop sticky valves, noisy hydraulic valve lifters, and sluggishness.

But Miracle Power provides lubrication under all circumstances. It contains colloidal synthetic graphite in suspension. The graphite forms a lubricating film that sinks into metal like hot butter into bread

This coating won't burn off and it doesn't build up. It keeps your engine always tuned, prevents dry starting damage, lubricates in the combustion chamber, frees sticky valves and hydraulic lifters, cuts oil consumption.

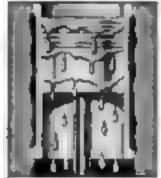
Car makers recommend Miracle Power®

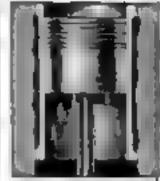


Miracle Power is not a chemical. It's all lubricant, and the only product of its kind approved by and specially pack-

aged for leading car makers and their dealers. Ford (shown here), Kaiser, Willys. It has to be good.

Follow the lead of auto engineers and prove it yourself Add an 85c can to your oil and gas every 1000 miles, use the 39c size in gas between treatments.





It takes up to 5 minutes for oil to be pumped to all maving parts of your engine. Meanwhile, your motor is running "dry"... and wearing out fast, Miracle Power prevents dry starting damage.

Get Miracle
Power at car
dealers, garages, service
stations. It
treats the engine, not the
oil.



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Mufflers * Pipes * Miracle Power * dgf 123



NEW 12-FT. POCKET TAPE MAKES L-O-N-G MEASUREMENTS EASY

made only by EVANS



No longer need you make two measurements for 12 ft lobe at you must do with shorter lapes throme plated case is no larger. Each EVANS Tape parked to FREE transparent Tenite utidity case.

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Wider (%,") heavy-duty hade make those those tong upright measurements easy and accurate Eacturies EVANS doubte trackings same as 12 h pocket tape FREE helt city and Tente utility the with every EVANS King-Size.



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*Well be cooler this Summer, warmer next Winter, with

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INSULATE YOUR HOME now with new Gold Bond Twinsulation, the most efficient home insulation against summer heat and winter cold ever



designed. Twinsulation has a double action. The fireproof rock wool center blocks heat, and the aluminum surfaces reflect heat. Twinsulation will actually keep your rooms up to 15° confer this summer, and cut next winter's heat bill up

to 20%. Soon pays for itself! So easy to install...
you can do an average attic in a few hours time!
Start now...see your Gold Bond dealer today!

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lenciose toy for "Home Insulation" booklet.	
Name	
Address	
City State State	

Let's Go Driving on the Railroad [Continued from page 120]

down. That raises or lowers the flanged wheels.

Other changes were made. The standard sedan low-pressure tires were replaced with heftier, light truck tires inflated to 60 pounds

To keep the car on the rails, "air lifts"—often used by hot-rodders to stiffen their suspensions—were put inside the front coil springs. Because the rear wheels are not independently sprung, no such precaution was needed there. But three leaves were added to stiffen the semi-elliptics. Coils, just clearing the

A cemetery is a place where a lot of overambitious drivers come to a dead stop.

-The Shewalk Screentenbert

body with a light load, were put on to prevent bounce under extra weight.

To get traction in the rear, 60 percent of the weight was put on the tires. In front, the flanged wheels bear 60 percent of the weight to keep them on the rails

Wheel treads were altered to conform with the 56.5-inch width between rails by sawing the rims off the wheels and rewelding them. The frame was extended slightly fore and aft to take the anchorages for the flanged wheels.

No change was made in the rear axle, transmission or brakes. The rubber-tired rear wheels drive "100" on the road and on the rails. Standard hydraulic brakes stop it. Good judgment is required to drive it on the rails if they are slicked by rain, snow or ice. Traction under such conditions is even less than it is on a highway.

The car was rebuilt at the Central's Collinwood experimental shops in Cleveland on President Perlman's orders. He knew what he wanted—he had had a similar inspection car, with flanged wheels that had to be raised and lowered by hand, when he was head man on the Denver & Rio Grande Western Railroad.

Under the Beauty...

Steel for strength... Leather for comfort!

You'll like the skillful way that Estwing craftsmen combine leather and steel in making the world's only one piece hammers and hatchets.

Perfectly balanced and beautifully finished, Estwing is the choice of skilled tradesmen the world over.

Available at your favorite hardware store. \$3.95

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Paint Remover

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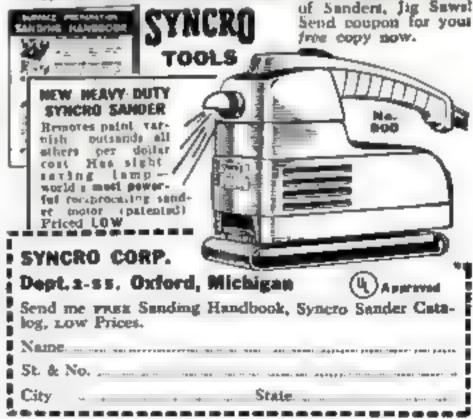
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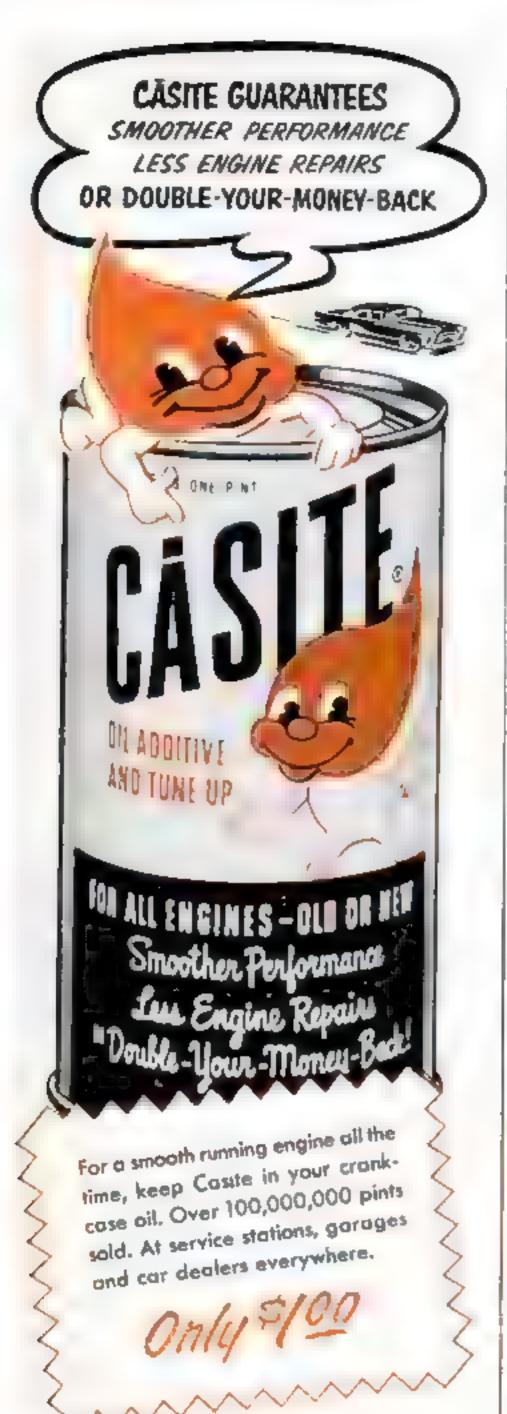




For DO-IT-YOURSELFERS! Free new 20-page handbook explains sanding technique on

wood, metal, glass, plastic, shows correct methods, names the proper tools for removing authors of different types of woodwork Luis sandpaper grades, uses, teds how to sand hard to-reach places, etc. Helps you save time, money on home projects-invaluable to beginners, experts. Authoritative, informative! Fully illustrated. Includes Syncro catalog





He's Building a Steam Car [Continued from page 198]

Pursuing his fascination with the very small, Boss has built minute steam engines of %" bore and stroke, with boilers to match. An experimental flash-steam car about 3" long has as its boiler a coil of small copper tubing, fed with water by a pump geared to its tiny double-acting engine. A more ambitious steam venture is the O-gauge locomotive shown on page 197.

In the same scale, Boss has added intricate detail to rolling stock, including vestibule steps that fold down and a dining car outfitted with tables and chairs, glasses, shakers and menus on the tables; and pots and pans in the galley.

But O gauge is too large to challenge Boss now. Not long ago he discovered TT gauge. Into a portable box the size of a suitcase he built a compact little layout complete with two-level track, figures, houses and landscaping (PSM, Sept. '54, p. 182)

Using kits as a basis, Boss added working valve gear to the locomotive, steps and ladders to the cars, and even ratchet wheels to the brake staffs. Until you use a magnifying glass, you have to take his word for it that these have teeth.

Boss makes human figures and such minute accessories as crossing signs out of steel and brass. Even the gutters and downspouts on the tiny general store in the layout are made of metal,

They were formed, Boss explained, by cutting strips of shim brass and drawing it through successively smaller holes in a die plate. I asked him why he hadn't used wire for the downspouts at least, since it would look exactly the same.

"Well," he answered with a perfectly straight face, "you couldn't drain anything through it."

In the Heart of Texas

"What do you have that is of unusual interest in your city?" asked a dear old lady touring Texas.

"Well," said a native, "we have the only helium plant in the world."

"You don't say, Is it in bloom?"-Wireco Life.

Get the brake linings with the

IRON GRIP



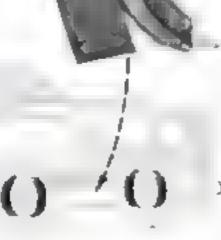
Genuine Ford brake linings are heat-tested, torture-tested to prove they'll keep their iron grip

When new brake linings are called for in your Ford it's very much to your advantage to specify Genuine Ford brake linings. Here's why . . .

By insisting on Genuine Ford linings you are assured of (1) parts that are made specially for your Ford and (2) parts that have had to undergo 3,250 actual tests to prove they can "take it" under the most gruelling conditions.

When replacements will add to your Ford's performance, always make sure you're getting Genuine Ford Parts. They're made right to fit right to last longer!

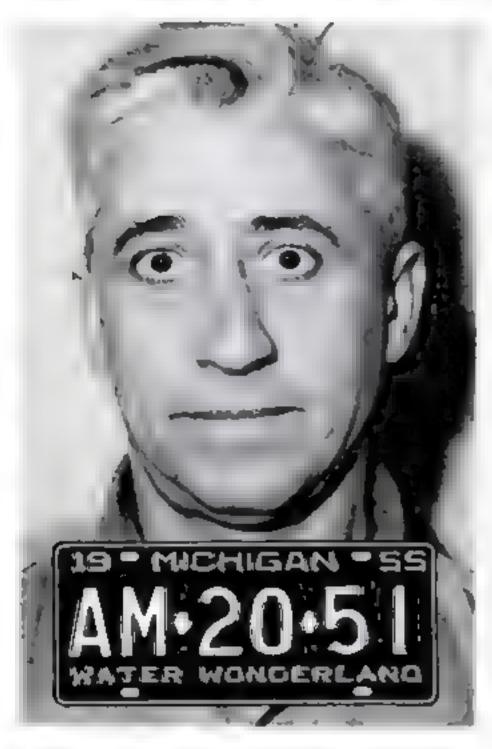




Keep your Ford all Ford

May is National Safety Month—Be sure you can see, steer, stop safely.

GUILTY OF NEGLECT!



This motorist neglected to have his service man check his oil filter every time he changed The penalty: his oil. A clogged oil engine repairs. filter lets gritty road dust, hard carbon and sludge grind away at delicate engine parts. Keep out of trouble! Ask your service man to check your filter when changing oil. on Purolator -- toughest, most efficient filter made. There's one engineered for every make of car. Refills cost as little as \$1.60.

PurOlator

America's No.1 OIL FILTER

"Purclator." Rey U S Pat. Off. Purclator Products, Inc., Rahway, N J., Toronto, Canada Diamonds Are Where You Make Them
[Continued from page 112]

and pressed it against a polishing wheel, he found a core of superhard matter that refused to wear away.

A tiny glittering crystal appeared in the midst of some dark, gritty stuff. Strong removed the crystal and tried one of its hard points against three of the hardest substances known—sapphire, which rates 9 on a hardness scale on which diamond is 10, and silicon carbide and boron carbide, which rate 9.5. The crystal easily scratched all three. Almost

certainly it was a diamond,

Additional tests on this and other GE-made crystals proved that the scientists had, indeed, reached their goal, Tiny though they were, the man-made crystals scratched natural diamonds. They refracted light as natural diamonds do. They had the same chemical content as natural diamonds. And their "finger-print"—the crystal structure shown by the X-ray diffraction pattern—was identical with that of natural diamonds that were compared with them.

When GE announced its findings, in February, it had produced diamonds more than 100 times, using a number of combinations of heat, pressure, time, and starting materials. It had also produced them in a 400-ton press as well as in the

more expensive big one.

GE's largest diamond—not quite 1/16 inch long—is still the first one. All the others would be classified as diamond dust. Arranged end to end, 100 of them would cover a line no longer than one inch. But even such tiny stones have value. Industrial diamonds—essential for cutting, grinding, drilling, and polishing hard materials—cost about \$7,000 a pound, and the U.S. uses an estimated \$25,000,000 worth a year.

The company is not yet ready to produce even diamond dust commercially. Whether or not it can ever produce diamonds of gem quality and size, it does not know. "But if we can do it in a small way," says the company's president, Ralph J. Cordiner, "I think we can do it

[Continued on page 266]



VISIT YOUR PORTER-CABLE DEALER OR MAIL COUPON TOU

PORTER-CABLE MACHINE CO. 5155 N. Salina St., Syracuse 8, N. Y.
Send complete information on the Model 215 Saw
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Address

Now! Professional quality in a 7" saw — at only \$75!

Stop envying the man with a Porter-Cable quality saw—see the great new 7" Model 115 at only \$75!

Here's true professional design and construction—power and speed to spare—suggedness for the hardest kind of use. Yet the 115 is light and compact, perfectly balanced—a honey to handle on any job.

Efficient 7" blade makes full 45" cuts in 2" dressed lumber. Big 10 Amp, universal motor and precision ball bearings give a speed of 4500 RPM under load. Instant depth and angle adjustments, telescope safety guard, exclusive Kickproof Clutch. Accessory table quickly converts the Model 115 to a big-capacity, precision table saw.

Like all Porter-Cable tools, the 115 is built to last through years of faithful, dependable service. Look at it and try it soon.

MODEL 115 SAW ... COMPLETE, ONLY \$75

With Kickproof Clutch, combination blade, double end wrench, 10 ft. cord and plug. Full line of accessory equipment includes cross-cut and rip blades and guides, abrasive blades for problem materials, handy carrying case.

Porter Cab	le
Homemaster Too	4





The Jacobs Plain Bearing Chuck equipped with threaded locking collar makes any drill press a safer, surer, more versatile tool.

Safer because the threaded collar keeps chuck locked on tapered spindle regardless of speeds

or type of thrust.

Surer because it's a Jacobs, the most accurate, holdingest, longest lasting chuck of its

kind -- anywhere.

More versatile because it eliminates the necessity of using special collet chucks or similar adapters for holding routing, carving or dovetailing bits.

When you work with a drill press or portable

electric tool you'll hold your drill or bit best when you use a Jacobs Chuck. There is none better for accuracy, grip and durability. The Jacobs Manufacturing Company, West REMER-REE Hartford 10, Connecticut.





Diamonds Are Where You Make Them [Continued from page 264]

in increasing quantities and increasing

Two rugged individualists in a New York City suburb let it be known, the day after GE's spectacular announcement, that they, too, had been making diamonds. But their diamonds were only dust, they said, so they had withheld the news.

One of these scientists was Dr. Leandro Tomarkin, a graying-haired, Swissborn biophysicist who had come to this country as Secretary General of the Second International Conference of Physics, Chemistry and Biology, held at Columbia University in 1940. The other was Mario Vilella, a graduate of the University of San Juan, Puerto Rico, who had come to New York in 1945 as chief chemist for a research company.

A stocky, black-haired, intense young man. Vilella had devised an apparatus in his spare time into which enough heat could be poured and enough pressure applied—he thought—to make diamonds. Tomarkin, who had been interested in Moissan's experiment, thought Vilella's approach was promising. Further, he realized that if the young chemist's apparatus would turn carbon into diamonds, he should also be able to make interesting and profitable new alloys.

Tomarkin organized the Vitron Research Corporation, and raised \$150,000 among his acquaintances—including a New York diamond dealer. Then he and Vilella moved their families to a secluded 17-acre estate in southern Rockland County, N. Y., and turned the cow barn into a laboratory.

They bought a press-only a 300-ton one, but big enough to give a 500,000psi squeeze. They couldn't get enough power from the local electric company, so they also bought a 25-kilowatt generator.

A novel part of their apparatus, the chamber holding the material to be squeezed, consists of a cylindrical aluminum shell with a layer of refractory or

[Continued on page 268]

MORE POWER PER DOLLAR

with Millers Falls



POWER TOOLS

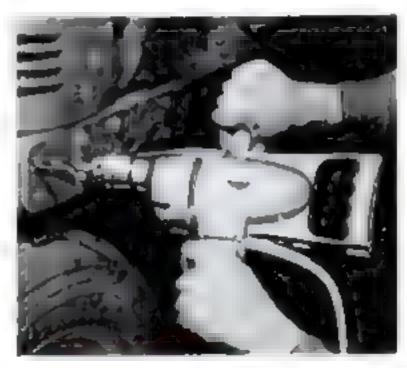
When you buy power tools, make sure you ger POWER - lots of it! Buy Millers Falls Dyno-Mite Power Tools. They're rugged, dependable and powered to handle the toughest kinds of jobs. And they're built with all the skill and quality that have made Millers Falls Tools world famous. See them at your hardware dealer's. Write, too, for free illustrated folders.

> MILLERS FALLS COMPANY Dept. PS-7 . Greenfield, Mass.

DYNO-MITE ELECTRIC SAWS are real gluttons for work. Three great models. No. 600 - a new, economically priced 6" now with 1%" capacity, \$43.50. No. 610 - a husky, heavy-duty 6" model with a 1/2 h.p. motor, \$59.50. Ne. 700 a larger, heavier saw that cuts up to 216", \$67.95.



LOADED WITH POWER and famed for performance, this Millers Folk 1/4" Dyno-Mite Drill is the finest in its class, It's compact and light with a full 1.7 amp, rating - plenty of power for drilling 14" in steel, up to 14" and even higher in wood. Power to spare, too, for operating polishing bonnets, grinding wheels and many other attachments. No. 1614, \$22,35.



MOST POWERFUL DRILL of its type, this Dyno-Mite 15-inch Drift is an unbeatable buy. 3.0 amp. rating. Drills up to 1/2" in steel, concrete, mosonry - up to 1" in wood - without stalling or overheating. Also ample power to operate hole saws up to 21/4" diameter. No. 912, \$40.95.

DYNO-MITE POWER WORKSHOP

A sensational new multi-purpose tool that gives you the start of a complete power workshop for only \$39.95. That's all it casts to own the No. 888 Dyna-Mite Power Unit that packs a full 1/3 h.p. and comes fully equipped as a 1/2" Drill, 6" Partable Disc Sander and 6" Polisher. Then, by adding inexpensive attachments, you can convert the \$88 into a whole workshop of power tools including an Orbital Sander, a 6" Partable Circular Saw, a Portable or Bench Jig Saw, a Bench Sonder, a Bench Grinder, a Drill Press and a 61/4" Circular Bench Saw.



TRUE TEMPER. Hammer News



NEW KIND OF HAMMER

Head won't loosen; shaft won't break

R-R-RIP—pulling heavy nails won't bend or break the handle of the ROCKET hammer—it's a tube of boron alloy steel. The head is locked to the shaft—can't fly off, can't even loosen.

WHAM—when the hammer hits a nail, the hollow shaft and rubber cushion grip soak up the shock. It's the best-feeling hammer you ever

swung and perfectly balanced, too.

Cushion grip won't slip even when wet or in gloved hand. It's bonded permanently to the shaft. See the ROCKET at your hardware store. \$4.35°. Write for free folder. True Temper Corp., 1623 Euclid Ave., Cleveland 15, Ohio.







Finnet quality in hammors, betchets and axes - Lown, garden and farm tools - Shevels - Shears - Fishing tackle - Galf-cint shafts

Diamonds Are Where You Make Them

[Continued from page 266]

heat-resisting powder bonded to the inner wall. A thick steel jacket surrounds it when it goes into the press. The apparatus is so wired that electric current passes from the piston of the press through the contents of the cylindrical chamber. When Vilella wants, he can get a temperature of "better than 5,000° F." in his pressure chamber. He received a patent on this apparatus last November.

For diamond making, the chamber is about as big as a small thimble and is packed with carbon-containing material—burned sugar, in at least a few of the

runs-and some other things."

The cow-barn experimenters say they made their first diamonds in the fall of 1952—identifying them by tests of hardness, specific gravity, optical properties and resistance to acids. Later they delivered samples to Dr. H. F. Mark, Director of the Polymer Research Institute at the Polytechnic Institute of Brooklyn. Mark confirmed that the samples were diamonds by the test of micro-X-ray diffraction with single crystals (which was not known when Hannay and Moissan did their work).

This spring Vilella and Tomarkin demonstrated in a general way how their process works. Into an aluminum tube six inches long and 1½ inches in diameter, Vilella poured a mixture of powdered nickel and red phosphorus. He slipped the tube into a steel cylinder and placed the cylinder in the press. Tomarkin started up the generator, which filled the barn with a piercing, whirning noise. Vilella turned on the press and

then the heating apparatus.

The ram of the press dropped slowly, and the needle on the gauge began to climb. When it reached the point marking the equivalent of a 75,000-psi pressure, it stopped, quivered. For some seconds the ram hung motionless, then suddenly plunged down perhaps another inch—an indication that the stuff in the pressure chamber had reacted and

shrunk in volume.

[Continued on page 270]

Now-your car can have modern power brakes!



NOTE: "Spectacle test" above proves easy action of MoPar Power Brakes! To demonstrate the small amount of pressure required on brake pedal to bring car to stop eyeglasses were first placed on the pedal. Glasses were not damaged.

STAY SAFE—with brake replacement parts that are engineered especially for your car!

Service tip; Play safe with brake parts that fit right and work right in your Chrysler Corporation vehicle! Insist on parts provided in the MoPar Master Cylinder Repair Kit and MoPar Wheel Cylinder Repair Kit!

For cooler operating, safer brakes, get MoPar Heavy-Duty Brake Fluid!

MoPar Brake Fluid provides much greater protection against brake failure caused by overheated brake fluid because its boiling point is twice that of ordinary brake fluids.



MAY IS NATIONAL SAFETY MONTH
—GET A MOPAR SAFETY CHECK!

MoPar is the name of parts and accessories designed especially for your Plymouth, Dodge, De Soto, Chrysler or Impenal car, or Dodge "Job-Rated" truck.

New low-cost MoPar Power Brake Unit gives faster stops with half the effort—and it's easy to install!

If your car is "dated" for lack of power brakes, here's good news for you.

Now, you can enjoy the safety and ease of genuine power brakes just like those offered in the '55 cars.

Like thousands of other motorists, you'll find that a MoPar Power Brake Unit enables you to make the fastest, smoothest stops imaginable—with half the effort you'd normally use!

Today's finest power brakes are yours at a price to fit the most modest purse. Get your MoPar Power Brakes from your nearby Plymouth, Dodge, De Soto or Chrysler dealer or better repair shops everywhere.



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When it's weeding you're needing, ask your garden supply dealer about dry applied Sector controls. Easy does it with these clean compounds . . . quickly applied with a Scotts spreader or scattered over the lawn with a wave of the hand from a shaker box.

4-XD® - low cost weed destroyer, a discovery of Same Research, it kills Dandelions.
Buckhorn, Plantain and their ugly companions with no harm to grass

Hox to treat 50x50 feet of lown - \$1.75 BEST BLY — Big economy bug treats 11,000 aq ft - \$4.85

WEED & FEED—Double witchery in this Scotts product, feeds grass to greater health and new beauty as it knocks out weeds.

Box to treat 2300 square feet - \$2.95 Weed and feed 23,000 square feet - \$13.75



tout for the femous orange and gree to design packages at your favorite town cores retailer — or drop a card to —

O M Scott & SONS CO, Marywille, Ohio

Diamonds Are Where You Make Them [Continued from page 268]

The two men threw switches. There was a sudden quiet, Vilella worked another control and a great puff of smoke filled the barn as the aluminum chamber popped out of the jacket and fell to the base of the press, where it flared brightly.

It was an eerie, almost diabolic, seene The chemist admitted later that it need not have been so dramatic; ordinarily be keeps the chamber in the press until the contents cool. Then there is no flame.

But is there ever any danger? Vilella pointed to a row of windows 12 feet from the press. Chips from a steel pressure jacket had torn through two of them; other chips had gashed the walls.

Once the cylinder had cooled, Vilella cracked it open lengthwise with an ax head, knocked off the concretelike substance that had been the refractory powder, and exposed a rod of hard, glistening, pinkish metal, "Phosphor nickel," Tomarkin explained, "Highly resistant to corrosives. It has important uses if it can be made in quantity—and now it can be."

Using a heavier press, larger pressure chambers and more electric power, Vilella and Tomarkin expect to produce rare alloys on a commercial basis in the near future, and industrial diamonds—at a price low enough to compete with the natural product—within two years.

What about diamonds of gem size?

"You cannot help obtaining larger diamonds," Tomarkin answered, "when you have the optimum conditions under control." Said Vilella: "It's a matter of transforming all the material in the pressure chamber—not just some of it. We must experiment."

So the recurrent dream of laboratory diamonds seems to be coming true. But if you're looking for an engagement stone, you're still more likely to find it in a Kimberley mine.

Net Profit

Experience: What you have left after everything else is gone.—Hudson Newsletter.



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SIZE 16" to 30" TO

A "RIDING MODEL"

Now you can enjoy the small size riding lawn mower you want! MOVER CYCLE comes complete ready to convert your power lawn mower to a nigged, efficient "sides" Especially designed to work with low hip, engines. Weight of rider bears down on wheels, gives extra traction, improved performance. For to ride a real wizard for work! To hook on MOWER CYCLE, just remove out mower handle. Drill 8 holes in motor mounting plate. Fasten with nuts and bolts. Drive it away! Whether you have a new mower, or already have one, MOWER CYCLE converts it to a "rider". Weight only 37 lbs. If your dealer doesn't handle, write us for free details, Dept. PS today!

E. F. BREWER CO., Butler, Wis.



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Make acreens for your porch with simple tools like a saw, a hammer, scissors—and Reynolds Do-It-Yourself Aluminum. Reynolds screen frame members of good looking, non-rusting siuminum are easily cut and assembled. Attaching aluminum acreening is quick and simple. Ask for Reynolds Plan No. 117—only 25¢.

De-It-Yearself Aluminum is perfect for regular window acrooms. Your dealer has FREE instruction shoots. And now Reynolds offers New De-It-Yourself Starm Such Interchangeable with Screens!

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At Your Hardware or Building Supply Dealer Look for This Rock Containing

person and storm such sections of them or red o her o a wide variety of sheet designs o angles o fasteners o window hardware o Reynates plastic film o trim strip o Do-It-Yourself Plans and Ensi-Stidt Patterns.



As Easy to Work

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Available in Canada

NOW... longer furnace life

Dura-tube



hoat exchangers

Wort Burk Out!

Tests show that repeated heatings up to 1200° F. have no domaging effect on this durable Janitrat construction.



CAST INON OR STEE

heating heart is a combination of Janitrol's exclusive design and an amazing process developed for use on military aircraft parts to resist the corrosive effects of extreme temperatures. The American Gas Association permits Dura-tube operating temperatures of 1100° F.... 225° higher than for cast iron or steel! Learn why Dura-tube is quieter, safer and more durable.

But that not all!

A Janitrol summer air conditioner may be added to the furnace to bring 365-day comfort to new or older homes.



Get the facts on both Dura-tube limit the Win-Sum Twins, Jot your name and address below and send to



THE CANADA ACTAIN CONCRATION CONTINUES IN CASA

That Wonderful Machine on Your Wrist (Continued from page 147)

finishes, but that, synchronized with the starter's pistol, set down exactly the time elapsed.

All these are useful watches. The Swiss have also made many play pieces. When Farouk was king of Egypt he had a watch filled with birds that sang. There are watches in which duelists, clashing swords, pause to indicate the hour; others with revolving spinning wheels, a blacksmith hammering at his forge, a man and a woman kissing. One of the most famous shows a shepherd under a tree playing pipes while cupids swing to and fro, a dog barks, sheep bleat, and a girl beats time on a carillon as she reads from a score.

The smallest watch the Swiss have developed is about the size of a match head. This pigmy instrument has been fitted into perfume-bottle corks, pencil ends, earrings and belt buckles. Once an African chief ordered one because he wanted a watch small enough to put into one of his gold teeth.

Although the watch of today is an extraordinary mechanism, the search for the absolute goes on—the timepiece that needs no attention, that will never lose or gain, that cannot break or stop. There are already electric and, even better, electronic watches. The tiny transistor promises an application to timekeeping. But whatever improvements the future may bring to the watchmaker's art, the Swiss intend to keep on ticking their way to world leadership.

He Asked for It

The car pulled up to a gas station and the attendant cleaned the windshield, put in gas and oil, watered the radiator, checked the pressure of all the tires and brought cold water for the children.

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"Yes," said the woman behind the wheel. "Will you please fold my road map?"—Pure Oil News.

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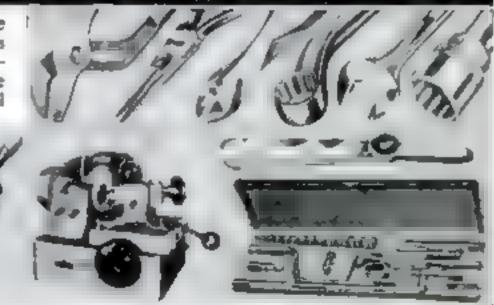
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Can Science Stop Dust Storms?

[Continued from page 163]

not helpless. He can plow his bare, dry land down six to 12 inches and bring up clods from the subsoil. Clods not only slow the wind but make nestling places for small dirt particles. The wind tunnel has shown how, by using different types of crop rotation, a soil loss equivalent to 74,000 pounds an acre can be reduced to a loss of only 970 pounds an acre.

Back at their laboratory in Manhattan, the scientists continue their studies in a second, bigger wind tunnel, 56 feet long.

Artificial barriers and shelter belts of trees and shrubs are set up inside—in miniature. In this tunnel, a solid wall, four inches high, didn't faze the wind;

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it jumped over and struck the ground on the other side. A wall with an opening at the bottom did more to stop the wind. By working with tiny snow fences in the tunnel, it was shown that ordinary snow fences, four feet high, spaced 40 feet apart, would reduce wind velocity by about half.

The Manhattan soil men indicate that the ideal solution would be a conditioner that makes the soil resistant to blowing. The most promising is an asphalt emulsion that is sprayed on the land. It gives complete protection, but is too costly to be practicable.

Another suggestion is that furmers make their own wind-resisting clods by mixing and pressing soil. The problem is to find the right moisture content and to develop tools. It is being worked on.

Zingg and Chepil are hopeful that, before another severe drought brings on tragic dust bowls such as those of the Thirties, their wind tunnels will come up with the right answer.



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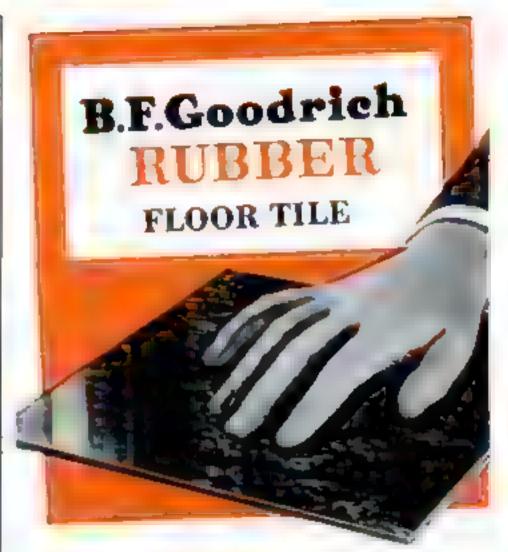
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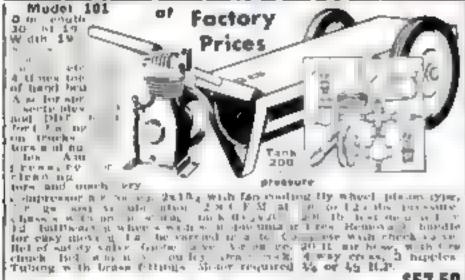
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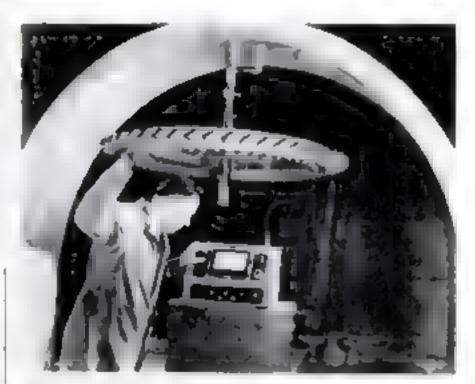
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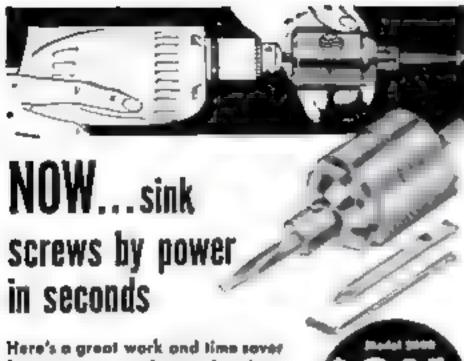
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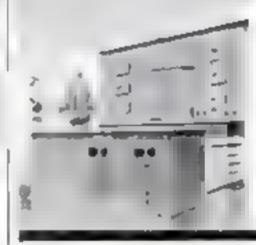
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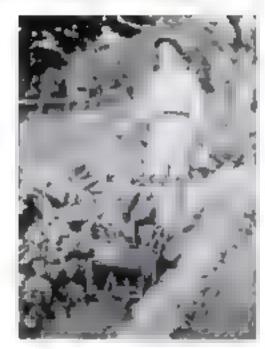
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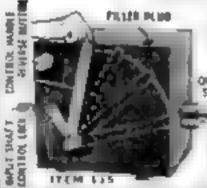
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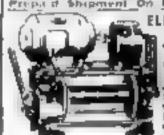
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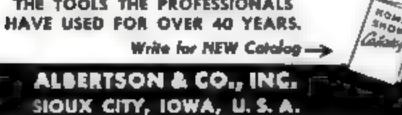


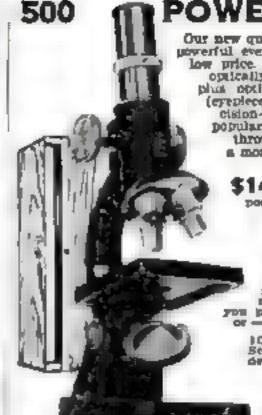


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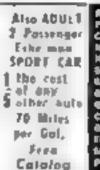
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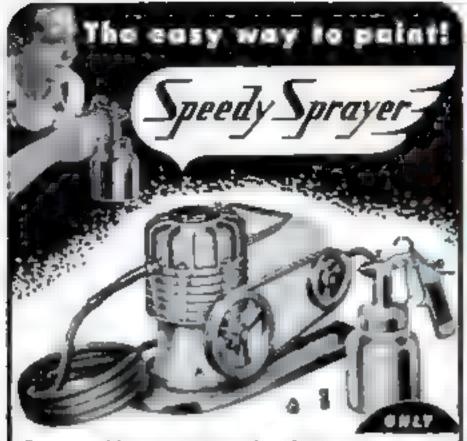
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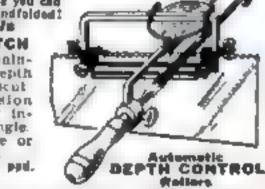
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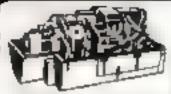
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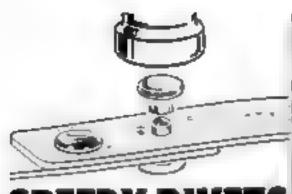
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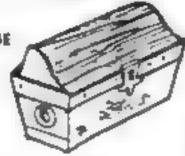


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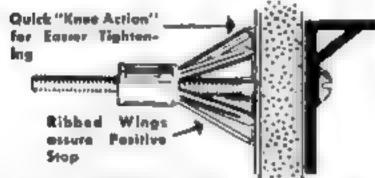
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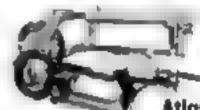
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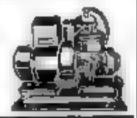
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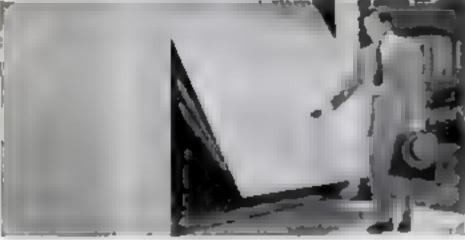
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[Continued from page 122]

long range, where high speed is not the main factor. Thus the turboprop may very well become tomorrow's workhorse of the air.

U.S. turboprop engines have all been designed for the military. They power (mostly experimentally or for service tests) many types. These include a version of the C-124 Douglas Globemaster, a 200-troop-carrying monster; the 40-troop Piasecki H-16 helicopter; an F-84 fighter, replacing jet power to see how it works; the two Navy VTO (Vertical Take-Off) planes. These are powerful engines, perhaps too powerful for economical use by commercial airlines.

Three engine manufacturers, however, believe that they now have turboprops, modified from military versions, that can be used to power commercial transports. Allison Division of General Motors recently announced that it was making a commercial version of its military T56 turboprop engine available to U.S. airlines and airframe manufacturers. They claim that this Model 501-D10, developing 3,750 horsepower, could raise the speed of a four-engine airliner to 450 miles an hour. That is about the speed of the British Comet I jet, and is faster than the P-38 Lightning fighter of World War II.

• Pratt and Whitney has a PT2 turboprop, a commercial development of its 5,700-horsepower T34 military engine. The PT2 is being considered for Lockheed's 1449, a Super Constellation modified as a turboprop airliner.

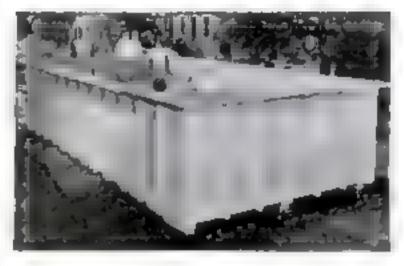
• Curtiss-Wright's T49 military turboprop puts out more than 10,000 horsepower. It is so powerful, and so efficient in using its power, that two of them, flying experimentally in a six-engine B-47 Stratojet bomber, replace four J47 jet engines. (A single J47 jet packs an equivalent of about 6,000 horsepower at 375 miles, and more than that at high speeds.)

That's a lot of power for an airliner to take on. You wouldn't want it, you couldn't use it, the airplane couldn't handle it. Roy T. Hurley, president of Curtiss-Wright, agrees, but he has a simple solution: Down-rate the T49 for commercial use; gear it down so that it could put out no more than two-thirds, or even less, of its maximum capability.

As commercial power packages, however, these U.S. turboprops, like several new British ones, are not yet in actual production. Even if orders came right now, it is doubtful that they could go into airline service for about three years. This means that Capital's and Trans-Canada's new Viscount turboprops will meet no competition in this country until 1958.

By that time, there may be a jet flying a U.S. airline. Boeing recently announced that orders placed this spring for a commercial version of its 707 jet transport could be delivered in 1958.

NEXT MONTH ... How to Build a Plywood Swimming Pool



NAIL standard-size sheets of waterproof plywood to a framework of two-by-fours, calk the joints like a boat and you've got a swimming pool. No need to break your back digging a hole, for the pool stands aboveground. For all the details on how to do the job, be sure to see the June issue of Popular Science Monthly. The cost? Just a little over a hundred dollars. Time required? Two weekends.

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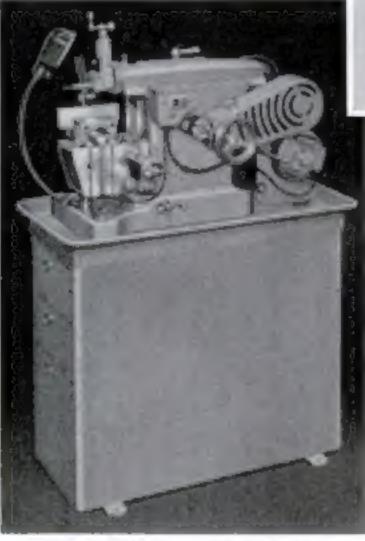
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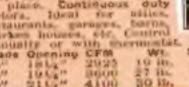
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